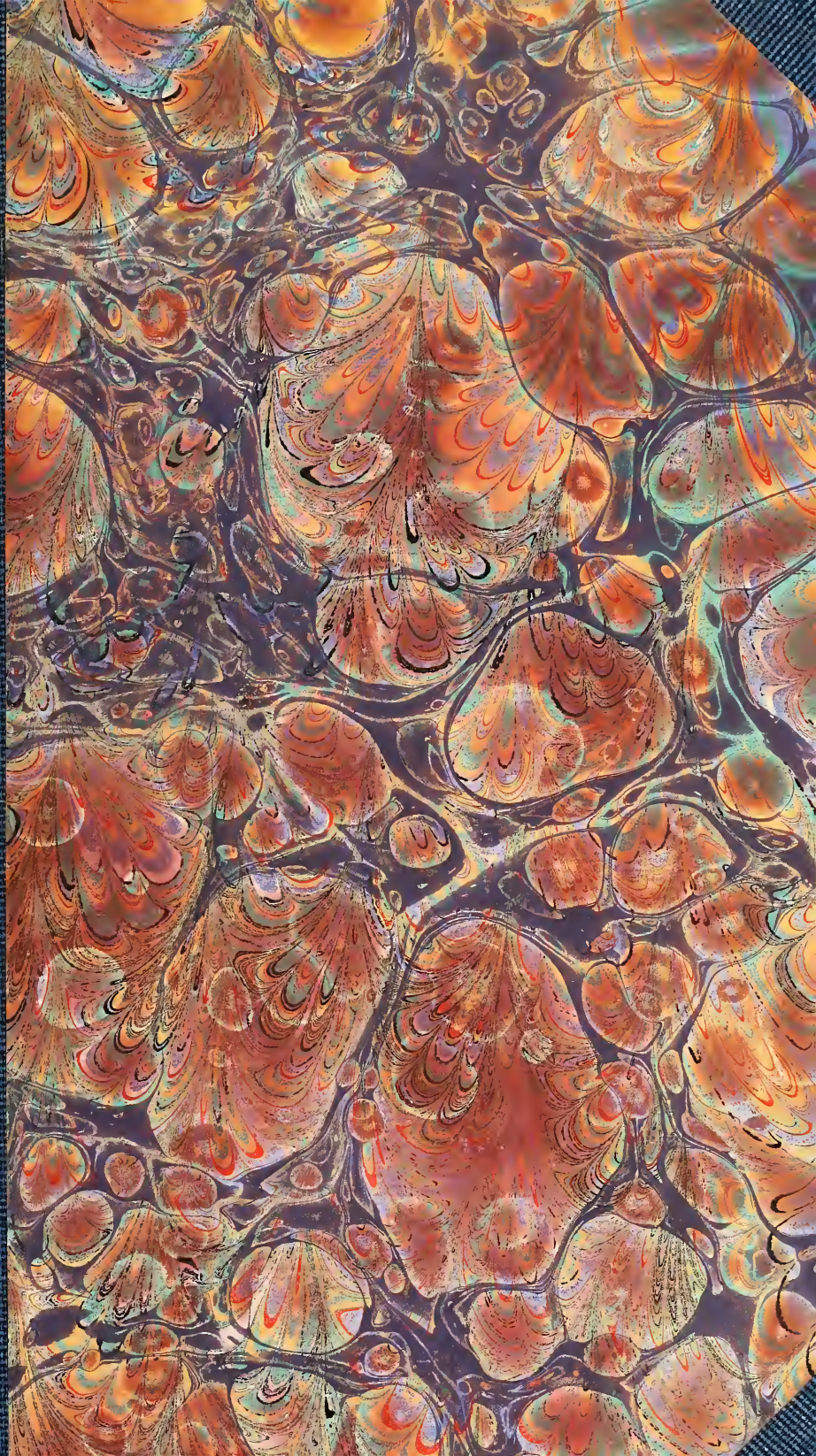

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Questions

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ON

ANATOMY,

FOR THE USE OF STUDENTS.

BOSTON MEDICAL
JUN 5 1890
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By CORYDON L. FORD, M. D.,
Prof. of Anatomy in the University of Michigan.

ANN ARBOR, MICH:
GILMORE & FISKE, BOOKSELLERS.
1873.

QUESTIONS

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ANN ARBOR PRINTING AND PUBLISHING COMPANY.

1873.

Entered according to Act of Congress, in the year 1865, by

C. L. FORD, M. D.,

In the Clerk's Office of the District Court of Michigan, at Detroit.

INTRODUCTION.

The favor with which those sixteen pages of "Questions in Osteology," published four years ago, were received, and the manifest advantages resulting from their use by the student, have prompted me to prepare a more extended series, embracing a much wider range of subjects. They are written for students attending my instruction, for whom they will possess most interest, and who will speedily recognize an endeavor to give a practical direction to all the knowledge acquired.

While aiding the student in acquiring definite information it is no part of my design to supersede the use of books, but on the contrary to secure the most profitable use of some good text book in aid of lecture room instruction.

These questions will be found useful to the student in his studies independent of a living teacher, by giving occasion for definite answers to definite questions on practical subjects.

In the questions on Surgical Anatomy I have sought to promote such study as will secure a knowledge of practical value to the operator.

I would encourage the student to accuracy of statements and of definition, and the employment of this little manual in examining each other will be useful.

The questions will be answered in the lecture room, and can be learned by the careful study of some good text book which no student should think of omitting.

C. L. FORD.

University of Michigan, October, 1865.

NOTICE.

The first edition of Questions on Anatomy being exhausted, I have taken occasion to make considerable addition in some branches, as well as to add questions in Histology, which I trust will be found as valuable assistance to the student as the question on Anatomy have proved.

I would recommend the student to interrogate himself by the use of these questions, after carefully reading, in some good work, the subjects of which they treat, feeling assured that they will do much to supply the want of a preceptor, whose duties to a student are not unfrequently sadly neglected.

The numbers that I have the honor to instruct fully appreciate the impossibility of giving them the benefit of such frequent examinations as I would like, and it has been my purpose, by these questions, to do the next best thing for them.

I fully appreciate that no reasonable amount of questions can indicate all that should be known, and am aware of many deficiencies. Notwithstanding these defects I commend them to careful use by those who would become better acquainted with Anatomy.

University of Michigan, January 1, 1873.

QUESTIONS ON ANATOMY.

What is Anatomy?
What is Phytotomy?
What is Zoötomy?
What is Comparative Anatomy?
What is Special Anatomy?
What is meant by Descriptive Anatomy?
What is Physiological Anatomy?
What is Pathological Anatomy?
What is understood by Morbid Anatomy?
What is Philosophical Anatomy?
What is Transcendental Anatomy?
What is Surgical Anatomy?
What is Topographical Anatomy?
What is meant by Artificial Anatomy?
What is understood by General Anatomy?
What is Microscopical Anatomy?
What is the meaning of Histology?
What is understood by Zoölogy?
What is Osteology?
What is a Skeleton?
What is a Natural Skeleton?
What is an Artificial Skeleton?
What is meant by Endo-Skeleton or Neuro Skeleton?
What is an Exo-Skeleton or Dermo-Skeleton?
What is a Sclero-Skeleton?
What is a Splanchno-Skeleton?
Give an example of each Skeleton?
How many bones in the Human Skeleton?
Why do Anatomists differ in the number?

Are teeth properly called bones?
What is the object of sesamoid bones?
Where shall we place the small bones of the Ear?
What is the usual division of the Skeleton by regions?
How many and what bones form the head?
What bones and how many form the trunk?
How are the bones of the trunk divided?
What number of bones in the upper extremity?
Name each in their proper order?
What number and names in the lower extremity?

GENERAL QUESTIONS, DEFINITIONS, &c.

For what purposes are bones employed?
What are the principal forms of bones?
What is the general conformation of long bones?
What advantage from large extremities?
What bones have a medullary canal?
At what period of time is this canal formed?
What purpose does it serve?
How is this canal filled in most animals?
How is it in the case of birds?
What are the principal uses of flat bones?
Where are the short bones most abundant?
What advantage results from these?
What are foramina?
What are canals in bone?
What are sinuses and how are they formed?
What are sinuosities?
What is meant by fossa?
What is the form of a glenoid cavity?
What is the form of a cotyloid cavity?
What part of bones receives the name of head?
To what part is the term neck applied?
What are condyles?
What are tubercles and tuberosities?
What are spines and spinous processes?
What is meant by crest or crista?
How are articular surfaces known?

STUDY OF INDIVIDUAL BONES.

What element characterizes all higher animals?
What position does the vertebral column occupy?
What is a vertebra?
What is its general object?
What is the meaning of the term?
What are the essential parts of a vertebra?
What modifications are observed?
What is the grand purpose of the vertebræ?
What is meant by false vertebræ?
How early does the ossification of a vertebra begin?
Describe the process of formation of a vertebra?
How many parts of each vertebra at birth?
How many accessory parts complete the bone?
At what period is the bone completed?
Of what parts does a vertebra consist?
Describe the form and structure of its body?
What is the shape of the surface of the body?
What is its shape in the vertebra of a fish?
How is it in the vertebra of serpents?
How many and what modifications from the human vertebræ?
How many and what processes to each vertebra?
What is usually the structure of the processes?
What is the object of the different processes?
What large foramen in the vertebræ?
What small one in the posterior part of the body?
What variety of form of spinal foramen in different regions?
What is the spinal canal and how formed?
What structures complete the canal between the bones?
Where and what is the ligamentum subflava?
What openings in the spinal canal and how formed?
What is the purpose of these lateral openings?
What occupies the spinal canal?
Does the spinal cord completely fill the canal?
How is a lumbar vertebra distinguished?
What is peculiar in its processes?
How may a dorsal vertebra be recognized?
In what respect is the spinous process peculiar?

How may it be known by its transverse process?
Wherein does its body differ from any other?
What peculiarities mark the cervical vertebræ?
Describe the transverse process particularly?
How is the vertebral canal formed?
What vessels are found in that canal?
How many of the vertebræ does the artery traverse?
How is the lower cervical vertebra distinguished?
Name the first and second cervical vertebræ.
What peculiarities distinguish the atlas?
How do we know the upper from the under surface?
What part of this bone sustains the head?
What motion is made between head and atlas?
Describe the spinous and transverse processes?
Why is the spinous process so small or wanting?
Why is the transverse process so large?
What is peculiar to the second vertebra?
What motion between atlas and dentatus?
Describe the odontoid process and its position.
What peculiarity in dentatus besides odontoid process?
Why is the lateral portion so strong?
Why is the spinous process so large?
What parts of vertebræ articulate?
What motion between the different parts?
How are the articular processes united?
Why do they vary in different regions?
How many true vertebræ, and how classed?
What is a false vertebra and how changed from true?
What is the object of this modification?
What bones do these false vertebræ form?
What material between the bodies of true vertebræ?
What are the properties of this intervertebral substance?
What are some of its modifications in animals?
How is it useful to the nervous system?
What is the form of the vertebral column?
How many and what curves in it?
What causes the frequent lateral curvature?
How are these curves useful to the nervous system?

BONES OF THE THORAX.

What is the shape of the thorax?
What bones enter into its formation?
How many ribs and how are they divided?
What are the characters of true and false ribs?
What parts of each rib are named?
Describe each of the parts common to all?
With what do the different parts articulate?
Describe the peculiarities of the first rib?
What vessels cross it and where?
Which of the ribs is longest and what is its direction?
In what respect are the 11th and 12th peculiar?
Do the ribs ever vary in number?
What occupies the groove at the lower edge of the rib?
What covers the inner surface of the ribs?
What is the structure of the ribs?
What part of a cervical vertebra corresponds to a rib?
Why are the ribs developed early?
Which true rib has the shortest cartilage?
Which one has the longest cartilage?
Describe the costal cartilages and their use?
How are these cartilages attached?
How are the cartilages of the false ribs arranged?
What purpose do these cartilages serve?
To what parts are intercostal muscles attached?

STERNUM.

What is the sternum and how is it placed?
Describe its form, structure and use?
What bones articulate with it, and to what parts?
What cartilages join it, and where and how united?
How many centres of ossification?
What defect sometimes from the mode of growth?
What ten muscles are attached to the sternum?
How is the sternum generally in mammalia?
What modification of it exists in birds?
What mammals have a crested sternum?
What is the purpose of this modification?

PELVIC BONES.

What bones form the pelvis?
How many vertebræ are represented in the sacrum?
Name its shape, position and structure?
With what bones does it articulate?
Describe its surfaces and borders?
What openings are there in the sacrum?
Name the parts that pass through each opening?
At what angle does it join the lumbar vertebra?
What kind of union with the innominata?
How many vertebræ are represented in the coccyx?
Describe its shape, position and articulation?
Name the position and articulations of the innominata?
How many and what primary points of development?
What epiphyses to complete the bone?
Into what parts is this bone divided?
What is the position of the ilium?
Describe the crest of the ilium—its shape and thickness?
How many and what processes upon this bone?
What names are given to its surfaces?
Describe the position and shape of the internal surface?
What lines upon the dorsum ilii?
Describe their shape and position?
What is the position of the ischium?
Into what parts is this bone divided?
Describe the position of each part named?
What process upon this bone and its position?
What is attached to the spine of the ischium?
What notches above and below that process?
Describe the position of the pubis?
Into what parts is the pubis divided?
Describe the position and shape of each part?
What and where is the symphysis?
Describe the angle, crest and spine of the pubis?
Describe the arch and its variations?
Where is the acetabulum and how is it formed?
Where is the margin strongest and where deficient?
How is it rendered deeper in life?

Describe the thyroid foramen and its use?
How does it differ in the sexes?
What muscles are attached to the crest of the ilium?
What ones to the anterior spinous processes?
What muscles are attached to the dorsum ilii?
What muscle covers the iliac fossa?
What muscles are attached to the tuberosity of the ischium?
What other muscles are attached to the ischium?
What muscles arise from the body of the pubis?
What ones are attached to its crest?
What muscles are attached to the rami of the pubis?
What is attached to the spine of the pubis?
What is meant by true and false pelvis?
What forms the division between them?
What is the inlet of the pelvis?
What are the diameters of the inlet?
What is the form and position of the inlet?
What parts bound the outlet of the pelvis?
Name the distinguishing features of the male and female pelvis?
With what does the pelvis articulate?

BONES OF THE LOWER EXTREMITY.

How many bones in the lower extremity?
How is the lower extremity divided?
Name the bones in each division?
How early does ossification commence in the femur?
When and where does the first epiphysis appear?
How many epiphyses and where are they situated?
At what period is the bone consolidated?
What are the parts named on this bone?
What is the form and the structure of the shaft?
Describe the linea aspera and its position?
What eminences at the upper part of the bone?
Describe the shape and position of each one?
Describe the length, size and direction of the neck?
In what particulars does the neck vary?
Describe the form of the lower end of the bone?
Name the eminences and depressions upon it?

With what bones does the femur articulate?
What muscles are attached to the great trochanter?
What ones are inserted in the trochanteric fossa?
What ones are attached to the trochanter minor?
What muscles to the different parts of the linea aspera?
What muscles are attached to the lower end?
How many muscles are connected with the femur?
Name each in order from above downwards?
Where are the crucial ligaments attached?
What are attached to the tuberosities of this bone?
Name the 22 muscles attached to this bone?

PATELLA.

What and where is the patella?
Describe its shape and structure?
With what bone does it articulate?
What muscles are attached to the patella?
To what part is each one united?
What is attached to its apex?
When does its ossification commence?

BONES OF THE LEG.

Describe the position of the tibia and fibula?
How many ossifying centres for each?
What parts are named upon the tibia?
Describe the head and its articulations?
What projection between the condyles?
Where are the tuberosities and tubercle?
Where is the facet for the head of the fibula?
Describe the diaphysis of the tibia?
What oblique line on its posterior surface?
Describe the lower extremity of the tibia?
With what bones does the tibia articulate?
What is the shape of the fibula and how is it divided?
How do the ends differ in form?
With what does the fibula articulate?
Describe the malleoli and their formation?
How much motion between the tibia and fibula?

Where is the motion the most free?
How are the two bones united?
Which of these two bones is longest?
What muscles are inserted into the tibia?
What muscles arise from it?
What muscles are attached to the fibula?
Name all the muscles attached to these two bones?

BONES OF THE FOOT.

How many bones in the foot?
How are these bones divided?
Name the tarsal bones and the position of each?
With what does the astragalus articulate?
What is the shape of its upper and its lateral surfaces?
With what do these surfaces articulate?
Describe the lower surface and articulation?
Describe the position and articulation of its head?
Name the form and position of the os calcis?
Describe the parts of the bone usually named?
Describe the articulating surfaces and the position of each?
Describe the inner and outer sides of the bone?
With how many and what bones does it join?
What bone above and what in front?
How many points of development?
What is the form and position of the cuboid?
With how many and what bones does it join?
Describe its surfaces and articulations?
Describe the form and position of the scaphoid?
With what bones does it articulate on each side?
Describe its surfaces and articulations?
How many and where are the cuneiform bones?
What is the position of the pointed extremity in each?
Which is the largest and which is the smallest?
Where do we commence to number them?
Describe the position and articulation of each one?
How many ossifying centres for each tarsal bone?
With how many does each one articulate?
How many and where are the metatarsals?

Describe the form and articulation of each?
Which is the largest and which the longest?
What is the shape of each extremity of the bone?
Describe the direction of the tarso-metatarsal articulation?
How many phalanges and their general shape?
How many and where are the sesamoid bones?
Name the bones from heel to toe, on the inside of the foot?
Name the bones from heel to toe on the outside?
What is the general form of the foot?
In how many ways is it arched?
What is the purpose of this arched arrangement?
What is meant by plantigrade?
What is meant by digitigrade?

OF THE UPPER EXTREMITY.

How are the bones of the upper extremity divided?
What are the bones of the shoulder?
Which one articulates with the trunk?
Describe the shape and position of the clavicle?
How do the ends differ and what do they join?
What is the form of the upper surface?
Describe the lower surface and its attachments?
What muscles are attached to the clavicle?
Name the places where muscles and ligaments are attached?
What ligaments are attached to the clavicle?
How early does ossification commence in this bone?
Is a clavicle present in all animals?
Name some of its modifications in animals?
In what class of animals is it found?

SCAPULA.

What position does the scapula occupy?
What is its general form?
Name and describe the three angles?
Describe and name the three borders?
Name and describe the three fossæ?
What is the form of the anterior surface?
What is the posterior surface called?

Describe the spine of the scapula?
What fossæ above and below the spine?
In what does the spine of the scapula terminate?
Describe the position and form of the acromian process?
With what does this bone articulate?
What is the position and form of the glenoid fossa?
What is the shape and position of the coracoid process?
Where is the neck of the scapula?
What muscles are attached to the spine of the scapula?
What ones to the dorsal surface of the bone?
What muscles are attached to its base?
What muscles to its superior border?
What ones to its axillary border?
What muscles are attached to the coracoid process?
Name the 16 muscles attached to the bone?
Mention the place to which each one is united?

HUMERUS.

What is the form of the humerus?
What parts are named in the upper third?
Describe the head and tuberosities?
What separates the two tuberosities?
What is meant by anatomical and surgical neck?
What is the form of the lower end of the bone?
What and where are the parts named on it?
Which condyle is most prominent?
What fossæ at the lower end?
Describe the articulating surfaces for ulna and radius?
With what does the humerus articulate?
What classes of muscles are attached to each condyle?
What muscles are attached near the middle of the bone?
What muscles inserted within two inches of the head?
What ones within four inches of upper end?
Name the place of attachment for each one?
What epiphyses has the humerus?
How many at the lower end of the bone?
Describe the situation of each one?
What is the structure of this bone?

OF THE FORE ARM.

What are the bones of the fore arm?
Which contributes most to the elbow joint?
Which forms most of the wrist joint?
What parts at the upper end of the ulna?
Describe the olecranon and coronoid processes?
Describe the greater and lesser sigmoid notches?
How are its articulating surfaces placed?
With what do these fossæ articulate?
What is the form of the shaft of the bone?
Describe the parts at the lower end?
With what does its lower end articulate?
What is the situation of the ulna?
With what bones does it articulate?
What is attached to the styloid process?
What muscle attached to the olecranon process?
What one is inserted into the coronoid process?
Describe the epiphyses of the ulna?
What is the position of the radius?
Describe the parts named at the upper end?
What is the form of the body of the radius?
What is the shape of its lower extremity?
Describe the articulation of each extremity?
With how many and what bones does the radius join?
What epiphyses upon the radius?
How are the radius and ulna connected?
In what position of the arm are they parallel?

BONES OF THE HAND.

How are the bones of the hand divided?
How many in each division?
How are the carpal bones arranged?
Name and describe the bones in each row?
Which ones articulate with the radius?
What is the form of the upper surface of the first row?
Where is the principal motion of the wrist?
How many points of development for each?
Which metacarpal bone is longest?

Which one largest, and which the smallest?
What is the general shape of each?
How do the ends differ in shape?
With what does each one articulate?
How many phalanges, and how arranged?
What are the peculiarities of each row?
How many and where are the sesamoid bones?

COMPARISON OF THE TWO EXTREMITIES.

What bone of fore-arm corresponds to the tibia?
What tarsal bone corresponds to the scaphoid?
Which tarsal represents the cuneiform and pisiform?
What tarsal bones correspond to each of the second row of carpal?
What is the typical number of carpal bones?
Which ones are double or compound?
What is meant by connate, as applied to bone?
What by confluent, and what example?
Which carpal articulates with two metacarpal?
Which tarsal articulates with two metatarsal?
Name the corresponding bones throughout the two extremities?
What difference in the development of the first and second metacarpals?
How readily distinguish between metacarpal and metatarsal?
Is the patella represented in the upper extremity?

COMPARATIVE ANATOMY OF THE HAND.

What is the maximum number of digits in mammalia?
In reducing the number, which first disappears?
Which is wanting in the next reduction?
Which is the third one to disappear?
Which digit is represented in the horse?
Which digits are represented in the ox?
In what class of animals are the radius and ulna separate?
How are these bones in the sheep and ox?
How are they in the horse?
How are they in the pig and in the cat?
How are the metacarpal bones in the dog?
How many are represented in the deer?
How many in the horse and how?

BONES OF THE HEAD.

How many bones in the head?
How are they divided?
What are the names of the cranial bones?
Give the number and names of the facial bones?
What bones are common to both?
What is the structure of the cranial bones?
Describe the outer and inner tables?
Which one forms the suture?
What structure between the tables?
At what time is this diploe formed?
What useful purpose does it serve?
For what purpose are these bones principally employed?
What bone articulates with the atlas?
Where is the occipital bone situated?
What is its general form?
With what bones does it articulate?
How many angles and how situated?
What is the most prominent part of the bone?
What lines running from it, and which way?
What line below the superior curved line?
What openings in the bone, and where?
What is the form and size of the foramen magnum?
What parts pass through this opening?
What parts pass through the condyloid foramina?
What part of the bone in front of the great foramen?
Describe its upper and under surfaces?
What bone in front of the basilar process?
What ridges and grooves on the inner surface?
What fossæ on the inner surface?
What rests upon the basilar process?
What fossa or notch on the edge of the bone?
What elevation by the side of the foramen magnum?
Describe their shape and articulation?
Between what bones are its angles received?
How many centres of development?
How many parts at birth?
With what bones is the occipital connected?

PARIETAL BONE.

Where are the parietal bones situated?
Describe the form of this bone?
What parts on the outer surface are named?
Which angle is the longest?
What is the position of each angle?
Describe each part named on the inner surface?
With what bones is it connected?
Name and describe each of the sutures?

FRONTAL BONE.

Where is the frontal bone situated?
How many points of development?
How is the bone divided?
What parts named on the frontal portion?
What processes at its lower border?
Describe the inner surface of the frontal portion?
Where is the orbital portion situated?
Describe its upper and lower surfaces?
What space between the two orbital portions?
What bone occupies that space?
Describe the cavities within this bone?
How are they lined and how filled?
How many and what bones join the frontal?
What bone behind its orbital portion?

ETHMOID BONE.

Where is the ethmoid situated?
What is its shape and its general structure?
What bones anterior and posterior to it?
What is the appearance of its upper plate?
What projects downwards from it?
What projects upwards, and its use?
What part of the orbit does the ethmoid form?
What bones surround this orbital surface?
What part of the nasal fossa does it form?
With what bones is it united by suture?
What bone posterior to the ethmoid?

SPHENOID.

Where is the sphenoid bone situated?
What are its principal divisions?
What is the central part called?
What is the structure of the body?
Describe the parts upon its upper surface?
What occupies the pituitary fossa?
What bounds that fossa in front and behind?
What projects downward from the body?
How many wings on each side and to what united?
What separates the two wings?
Name and describe the anterior one?
What does it join in front?
What process and foramen at its inner part?
What position does the great wing occupy?
How many and what surfaces upon it?
What do these surfaces help to form?
What is the shape of the cerebral surface?
What is the form of the temporal and orbital surfaces?
What part of the orbit is formed by it?
What foramina at the base of the great wing?
What processes project downward?
What is their length and position?
What space do these processes bound?
Which process is the broader?
Which one is the longer and where situated?
What fossa between the two processes?
What foramen at their base?
What passes through this foramen?
Where is the hamular process?
What muscle winds around it?
Name all the processes of this bone?
What nerves leave the cranium through this bone?
Name each foramen and what passes through it?
With how many bones is the sphenoid connected?
With what ones posteriorly and anteriorly?
With what ones latterly and inferiorly?
What cavities in the body of the bone?

TEMPORAL BONE.

What position does the temporal bone occupy?
With what other bones does it unite?
What are its primary divisions?
What position does the squamous portion occupy?
What process from this portion, and what fossa at its root?
Describe the upper border and the suture?
Where is the mastoid portion situated?
What fossa and grove on its inner side?
What opening between the squamous and mastoid portions?
Where is the petrous portion of the bone placed?
What is the form of this portion?
What opening at its base, and the size?
What process surrounds it?
What is attached to the auditory process?
What opening at the apex of the petrous portion?
What openings on the upper surface?
Describe the openings on the posterior surface?
What process projects down, and its length?
What openings on the inferior surface?
What cavity within the bone?
Name the parts that pass each opening?
What muscles are attached to this bone?

MISCELLANEOUS QUESTIONS.

What bones form the base of the skull within?
What ones form its lateral boundaries?
How is the base of the skull divided within?
What bones form the anterior cerebral fossa?
What ones form the middle and posterior fossa?
What bones form the cerebellar fossa?
What is received into these different fossæ?
What foramina at the base of the skull?
Name them in order from before backwards?
Which of these transmit nerves?
How many cranial nerves?
Which ones pass out without dividing?
Which divide within the cranium?
Name each nerve and its place of exit?

What blood-vessels enter the cranium?
At what foramina do they enter?
Where does the venous blood leave the cranium?
What vessels to carry it within the cranium?
What trace of them on the skull?
Name the principal sinuses?
How are the bones of the head connected?
What purpose do the sutures serve?
Name and describe the principal ones?
Which table of the bones form the sutures?
What is between the tables of these bones?
What cavity in the frontal bone?
What is its nature and object?
Do bones grow at the edges?
What are the ossa triquetra and their use?
Are sutures usually found in skulls?
What then is the real purpose of a suture?

FACIAL BONES.

How many and what facial bones?
Where are the nasal bones situated?
How long and wide and thick are they?
What bones and cartilage do they join?
Where are the malar bones situated?
How many and what parts are named?
How many surfaces and where are they?
What part of the orbit does it form?
With what do the processes unite?
With how many and what bones does it unite?
What muscles are attached to it?
Where are the lachrymal bones situated?
What is the size, form and use of this bone?
What bones above, behind, below and in front of it?
What muscle arises from it?
Where is the groove and how large?
What bone aids to complete the groove?
What is lodged within the groove?
What position does the superior maxilla occupy?
What is the form and structure of this bone?

What surfaces are named upon it?
Describe the shape and position of each?
What processes and where are they placed?
What foramina and what pass through them?
What part of the orbit does this bone form?
What part of the nasal cavity is made by it?
What part of the hard palate does it form?
How are the two maxillæ united?
With what other bones do they unite?
What foramen in the anterior part of hard palate?
What projection above incisive fossæ?
What cavity within this bone?
What is its general shape?
Where is the opening into the antrum?
Where is the palate bone situated?
What parts are named and how are they placed?
What part of the palate is formed by this bone?
What part of the nasal fossa is formed by it?
What part of the orbit does it form?
What foramen and what passes through it?
How many turbinated bones and where placed?
What is their size and structure?
Describe the form and position of the vomer?
With what bones and cartilage does it join?
What is understood by nares?
What form the boundaries of the posterior nares?
What forms the septum of the anterior nares?
What is understood by meati of the nose?
What bounds the lower meatus?
What is the direction of this passage?
What structures bound the middle meatus?
What is the extent of the superior meatus?
What openings into the upper meatus?
What ones into the middle and lower one?
What is the use of the sinuses and cells?
What kind of membrane lines them?
With what does the inferior maxilla articulate?
How is it divided at birth and when united?

Describe the form of the body and ramus?
How does the form change with age?
What processes and notch upon the ramus?
What and where are the openings in this bone?
What traverses the dental canal?
How many and what muscles are attached to it?
Name the point of attachment for each one?
Where is the os-hyoides situated?
How is it divided and where united?
How many and what muscles are attached to it?
To what is it attached by ligaments?

GENERAL QUESTIONS.

What is the general structure of facial bones?
How many points of development for each?
What is the shape of the orbital cavity?
What bones contribute to form it?
Name the position of each one?
What bones form the upper, lower, inner and outer boundary?
What openings into the orbital cavity?
Name the parts that pass each opening?
What bones form the hard palate?
What process in the centre passing backward?
What openings in it and where located?
What pass through the openings?
What bones form the vertex of the skull?
What bones form the temporal region?
What openings on the facial surface of the skull?
What pass through these several openings?
What is understood by facial angle?
What is the usual size in different races?
How is the angle measured?
What is the usual capacity of the cranium?
What is the maximum in cubic inches?
How much variation in different races?
What is the extent of the longitudinal diameter?
Between what points is it measured?
What is the extent of the lateral diameter?
What is the vertical diameter?

ON THE UNION OF BONES.

In what different ways are the bones united?
What is the nature of the union by synarthrosis?
What kind of union is that by sutura?
Name the principal varieties of suture?
Where is the dentated suture illustrated?
Give an example of the sutura serrata?
Where is sutura squamosa and how formed?
What kind of union is that known as harmonia?
Where and what kind is schindylesis?
What kind of union is gomphosis?
What kind of union is amphiarthrosis?
Give some examples of this union?
What name is given to the movable articulations?
What are the principal examples of diarthrosis?
What is the nature of that known as arthrodia?
Where is enarthrosis represented?
What are its essential features?
What kind of motion is the ginglymus?
What are its principal illustrations?
What is that known as diarthrosis rotatorius?
Name the five structures connected with these unions?

OF ORDINARY JOINTS.

What tissues form the ordinary joints?
What are the physical properties of cartilage?
By what means is articular cartilage nourished?
What is its structure and ordinary use?
Are vessels and nerves found in this cartilage?
How extensively does it cover bones?
Is it equally thick in all parts of the joint?
What connects the bones and how is it done?
Describe the tissue composing the ligaments?
What are its physical properties?
What can be said of its vascularity and sensibility?
How are the ligaments attached?
Are they continuous with the fibrous basis of bones?
What kind of membrane inside the ligaments?
Does the synovial membrane cover the bones?

OF THE UNION OF THE VERTEBRÆ

How are the bodies of vertebræ united?
What kind of material connects them?
What are the properties and advantages of this material?
How are the vertebræ connected in fishes?
What ligament on anterior surface of vertebræ?
What are on the posterior surface of its body?
What substance connects the vertebral laminæ?
What are the physical properties of this material?
How are the oblique processes connected?
What kind of motion between the various parts?
What ligaments connect the transverse processes?
What one connects the spinous processes?
What special arrangement between atlas and dentatus?
To what is the atlas most firmly connected?
What kind of motion between these two bones?
What ligaments are the bond of this union?
Describe them and their attachments?
What ligaments pass from dentatus to occipital bone?
What special purpose do they accomplish?
What motion between atlas and dentatus?
What modifications of atlas and dentatus from other vertebræ?
What ligaments connect lumbar vertebræ and innominata?
Where are they attached?
What union between sacrum and innominata?
What ligaments connect these two bones?
Describe those seen in anterior view?
What ones on the posterior surface of the pelvis?
Describe the greater and lesser sacro-sciatic ligaments?
What ligaments unite the pubic bones?
What ligaments connect the sacrum and coccyx?

LIGAMENTS OF INF. MAXILLA.

What ligaments at the temporo-maxillary articulation?
Describe the attachments of the two lateral?
Where is the stylo-maxillary ligament attached?
Describe the inter-articular fibro cartilage?
How is the synovial membrane arranged?

LIGAMENTS CONNECTING RIBS.

Describe the anterior costo-vertebral ligament.
How is the inter-articular ligament situated?
What other ligaments connected with a rib?
What ligaments connect costal cartilages with sternum?
What ligaments unite the pieces of the sternum?

LIGAMENTS CONNECTING CLAVICLE.

What ligament unites the two clavicles?
What ligaments from sternum to clavicle?
What ligament between rib and clavicle?
What structure between sternum and clavicle?
What ligaments at outer end of clavicle?
Where is the coraco-clavicular ligament?
What inter-articular cartilage and synovial membrane?
What are the ligaments of the scapula?

SHOULDER JOINT.

What ligaments pertain to the shoulder joint?
What arrangement has the capsular ligament?
What and where is the coraco-humeral ligament?
Describe the glenoid ligament and its use.
What is the arrangement of the synovial membrane?

ELBOW JOINT.

Name the ligaments pertaining to the elbow joint?
Describe the anterior and posterior ligaments.
What is the arrangement of the lateral ligaments?
What ligaments pertain to the radio-ulnar articulation?
Describe the annular or orbicular ligament?
Where is the oblique or round ligament?
Describe the interosseous ligament or membrane?

INFERIOR RADIO-ULNAR ARTICULATION.

What ligaments at lower end of these bones?
Describe the anterior and posterior radio-ulnar ligaments.
Where is the inter-articular fibro-cartilage, and its use?
Describe its shape and attachments.
What synovial membrane connected with these bones?

WRIST JOINT ARTICULATION.

What bones and cartilage form the wrist joint?
Describe the external and internal lateral ligaments.
How are the anterior and posterior ligaments arranged?
Describe the arrangements of the synovial membrane.
What motions are performed at this articulation?

ARTICULATIONS OF THE CARPAL BONES.

What motions between the several carpal bones?
What ligaments unite the first row of bones?
Describe the palmar, dorsal, and interosseous.
What ligaments connect the second row with each other?
What ligaments unite the first and second row?

CARPO-METACARPAL ARTICULATION.

What is the general arrangement of ligaments?
What is the nature and extent of the motion?

METACARPO-PHALANGEAL ARTICULATION.

What kind of motion at these joints?
What ligaments connect these bones?
What takes the place of a posterior ligament?

ARTICULATIONS OF PHALANGES.

What kind of motion at these joints?
What ligaments bind the bones together?
Can dislocation occur without rupture of ligaments?

ARTICULATIONS OF THE LOWER EXTREMITY.

Name the ligaments connected with the hip joint?
Describe the capsular and its attachments,
What is the character of the ilio-femoral?
Describe its position and attachments.
Describe the attachments of the ligamentum teres.
Is it torn in dislocation of the femur?
Where and what is the cotyloid ligament?
Where is the transverse ligament, and its use?
What about the synovial membrane?

KNEE-JOINT ARTICULATION.

Name all the ligaments connected with the knee-joint.
How many and what ones situated externally?
What are the attachments of ligament of patella?
How is the ligament of Winslow formed?
Describe the three lateral ligaments.
What is the character of the capsular ligament?
What are the attachments of the two crucial ligaments?
Describe the inter-articular cartilages and their use.
By what means and to what are they connected?
What and where are the coronary ligaments?
Describe the synovial membrane.
What is its comparative extent?
What is the nature of the ligamentum mucosum?
Where are the ligamenta alaria?

TIBIO-FIBULAR ARTICULATION.

What ligaments connect fibula to tibia at upper end?
What extent of motion at this articulation?
Describe the interosseous membrane.
What ligaments connect these bones at lower end?
Describe the ligament between the two bones.
Is there much motion at this extremity?
Whence the necessity for this unusually strong union?

LIGAMENTS AT ANKLE JOINT.

Describe the anterior ligament.
What is the nature of the posterior one?
What is the nature and extent of internal lateral?
Describe the external lateral ligament.
Where are its three several portions attached?
What about the synovial membrane?
What ligaments connect astragalus to os-calcis?
What ligaments connect the other tarsal bones?
What is the nature of the motion here?
What ligaments connect metatarsal and phalanges?
What ligaments connect the phalanges?
Do they essentially differ from the ligaments of the hand?

MUSCLES OF THE BODY.

As an aid in studying the muscular system, I have been in the habit of grouping the principal muscle, which will render them more easily recalled. This classification is not a substitute for further knowledge, but an aid in acquiring it, well worth careful attention. It cannot be amiss to urge upon students the importance of careful attention to the muscular system. In so many places they play such an important part in fractures and dislocations that the special study of their attachments and mutual relations will be well rewarded in subsequent confidence and success. Study them thoroughly:

GROUPS OF MUSCLES.

Epicranial region	Occipito frontalis.
Auricular group	Attollens aurem. Attrahens aurem. Retrahens aurem.
Palpebral group	Orbicularis palpebrarum. Corrugator supercilii. Levator palpebra superioris. Tensor tarsi.
Orbital group	Rectus superior. " inferior. " internus. " externus. Obliquus superior. " inferior.
Nasal group	Pyramidalis nasi. Levator labii superioris alæque nasi. Levator proprius alæ nasi posterior. Levator proprius alæ nasi anterior. Compressor nasi. Compressor narium minor. Depressor alæ nasi.
Labial group	Levator labii superioris alæque nasi. Levator labii sup. prop. Depressor labii sup et alæ nasi. Levator auguli oris. Zygomaticus minor. Zygomaticus major. Depressor agnuli oris. Depressor labii inferioris. Levator labii inferioris. Buccinator. Orbicularis oris.

Masticator group	Masseter. Temporal. Internal pterygoid. External pterygoid.

MUSCLES OF THE NECK.

Obliquely ascending group	Platysma-myoid. Sterno-cleido-mastoid. Omo-hyoid.
Directly ascending	Sterno-hyoid. Sterno-thyroid. Thyro-hyoid.
Obliquely descending group	Digastric. Stylo-hyoid. Stylo-glossus. Stylo-pharyngeus.
Lingual group	Mylo-hyoid. Genio-hyoid. Genio-hyo-glossus. Hyo-glossus. Stylo-glossus. Palato-glossus. Lingualis.
Palatine group	Azygos uvula. Palato-glossus. Palato-pharyngeus. Levator palati. Circumflexus palati.
Pharyngeal group	Constrictor pharyngeus superior. Constrictor pharyngeus medius. Constrictor pharyngeus inferior. Stylo-pharyngeus. Palato-pharyngeus.
Laryngeal group	Crico-thyroid. Crico-arytenoid lateralis. Crico-arytenoid posticus. Thyro-arytenoideus Inter-arytenoideus. Thyro-epiglottideus. Aryteno-epiglottideus superior. Aryteno-epiglottideus inferior.

Pre-vertebral group	Rectus capitis anticus major. Rectus capitis anticus minor. Rectus capitis lateralis. Longus colli.
Cervico costal group	Scalenus anticus. Scalenus medius. Scalenus posticus.
Costal group	External intercostal. Internal intercostal. Triangularis sterni.

MUSCLES OF THE BACK.

First layer	Trapezius. Latissimus dorsi.
Second layer	Levator anguli scapulæ. Rhomboideus minor. Rhomboideus major.
Third layer	Serratus posticus inferior. Serratus posticus superior. Splenius colli. Splenius capitis.
Fourth layer	Erector spinæ. Sacro-lumbalis. Musculus accessorius. Longissimus dorsi. Spinalis dorsi. Cervicalis ascendens. Transversalis cervicis. Trachelo mastoïdeus. Complexus. Biventer cervicis. Spinalis cervicis.
Fifth layer	Semi-spinalis dorsi. Semi-spinalis colli. Mutifidus spinæ. Rotatorius spinæ. Supra-spinales. Inter-spinales. Extensor coccygis. Inter-transversales. Rectus posticus major. Rectus posticus minor. Obliquus superior. Obliquus inferior.

MUSCLES OF THE ABDOMEN.

Lateral group	External oblique. Internal oblique. Transversalis. Quadratus lumborum.
Anterior group	Pyramidalis. Rectus abdominis.
Ischio-rectal group	Coccygeus. Levator ani. Sphincter ani.
Perineal group	Erector penis. Erector clittoridis. Compressor urethra. Sphincter vaginæ. Transversalis perinei. Accelerator urinæ.

MUSCLES PERTAINING TO THE UPPER EXTREMITY—MOSTLY ABOVE THE ELBOW.

Connecting shoulder to body	Pectoralis minor. Subclavius. Serratus magnus. Trapezius. Levator anguli scapulæ. Rhomboideus minor. Rhomboideus major.
Connecting arm to shoulder	Deltoid. Supra-spinatus. Infra-spinatus. Teres minor. Teres major. Subscapularis. Coraco-brachialis.
Connecting arm to body	Pectoralis major. Latissimus dorsi.
Connecting fore-arm to shoulder	Biceps-flexor-cubiti. Triceps-extensor-cubiti.
Connecting fore-arm to arm	Brachialis-anticus. Anconeus.

MUSCLES MOSTLY BELOW THE ELBOW, GIVING FOUR CLASSES OF MOTION; OF PRONATION, SUPINATION, FLEXION AND EXTENSION--19 MUSCLES IN ALL.

Pronators	Pronator radii teres. Pronator quadratus.
Supinators	Supinator radii longus. Supinator radii brevis.
Flexors of the hand	Flexor carpi radialis. Palmaris longus. Flexor carpi ulnaris.
Flexors of the digits	Flexor longus pollicis. Flexor sublimis digitorum. Flexor profundus digitorum.
Extensors of the hand	Extensor carpi radialis longior. Extensor carpi radialis brevior. Extensor carpi ulnaris.
Extensors of digits	Extensor indicis. Extensor communis digitorum. Extensor minimi digiti.
Extensors of thumb, (oblique extensors)	Extensor ossis met. pollicis. Extensor primi internodii. Extensor secundi internodii.

MUSCLES OF THE HAND--19 IN ALL.

On radial side of palm	Abductor pollicis. Opponens pollicis. Flexor brevis pollicis. Adductor pollicis.	
On the ulnar side of palm	Palmaris brevis. Abductor minimi digiti. Flexor brevis minimi digiti. Adductor minimi digiti.	
In the centre of palm	Lumbricales.	Four.
Anterior interossii		Three.
Dorsal interossii		Four.

MUSCLES ACTING ON THE LOWER EXTREMITY.

Flexors of thigh	Psoas parvus. Psaos magnus. Iliacus internus.
Extensors of thigh	Gluteus maximus. Gluteus medius. Gluteus minimus.
External rotators	Pyriformis. Gemellus superior. Obturator internus. Gemellus inferior. Obturator externus. Quadratus femoris.
Superficial group of thigh	Tensor vaginæ femoris. Sartorius. Gracilis.
Adductor group of thigh	Pectineus. Adductor longus. Adductor brevis. Adductor magnus.
Extensors of leg	Rectus femoris. Vastus externus. Vastus internus. Crureus.
Flexors of leg	Semimembranosus. Semitendinosus. Biceps flexor cruris. Popliteus.

MUSCLES OF THE LEG.

Superficial group	Gastrocnemius. Plantaris. Soleus.
Posterior tibial group	Tibialis posticus. Flexor longus digitorum. Flexor longus pollicis.
Anterior tibial group	Tibialis anticus. Extensor longus pollicis. Extensor longus digitorum.
Peroneal group	Peroneus longus. Peroneus brevis. Peroneus tertius.

MUSCLES OF THE FOOT.

Superficial group	Abductor pollicis. Flexor brevis digitorum. Abductor minimi digiti.
Middle group	Flexor accessorius. Lumbricales.
Deep group	Flexor brevis pollicis. Adductor pollicis. Flexor brevis minimi digiti. Transversalis pedis.
Plantar interossei	Three.
Dorsal interossei	Four.
Superficial dorsal. Extensor brevis digitorum	One.

QUESTIONS ON THE MUSCULAR SYSTEM.

EPICRANIAL REGION.

What muscle covers the top of the head?
Give the origin, insertion and general character.
What are its relations to the skin and the skull.
In what relation to it are the vessels of the head?

AURICULAR GROUP.

Give the name and position of each of the class.
Give the origin, insertion and action of each.
What covers and what lies beneath them?

PALPEBRAL GROUP.

Describe the orbicularis palpebrarum and its action.
Give its origin, insertion and exact position.
What muscle beneath this, above the orbit?
Describe its attachments, shape and action.
What muscles of the group mostly within the orbit?
Describe the levator palpebræ superioris, and its action.
What parts immediately above and below it?
Give the attachments and action of the tensor tarsi.

ORBITAL GROUP.

What are the muscles of this group?
Describe the attachments, shape and action of the recti?
Describe in like manner the oblique muscles?

NASAL GROUP.

Describe the pyramidalis nasi and its surroundings?
Give the attachments and action of each one?
What muscle raises the alæ of the nose?
What one depresses it, and where located?

LABIAL GROUP.

What muscles pass vertically to the upper lip?
Which muscle of this group next the nose?
What muscle parallel with it?
Give the attachments and action of each?
What muscle of the region depresses the upper lip?
What muscle elevates the corner of the mouth?
Describe its origin and position?
What muscles descend obliquely towards the mouth?
Give their attachments and action?
Which of them is most irregular?
Name the muscles moving the lower lip?
Give the attachments of the depressor of the lower lip?
What muscle elevates it and where situated?
What muscle depresses the corner of the mouth?
Describe its shape and relations?
What are the attachments of the buccinator muscle?
Describe its location and action?
Describe the muscle surrounding the mouth?
What general name is given to these facial muscles?
What nerve supplies this group of muscles?
What other nerve is distributed to the face?

MASTICATOR GROUP.

What muscles are included in this group?
Give the origin, insertion and action of the masseter?
What structures cover the masseter?

What supports its deep surface?
What is in contact with its posterior border?
What important parts pass over the masseter?
Describe the temporal muscle and its surroundings?
What structures conceal this muscle?
What are the attachments of the temporal fascia?
Where is the temporal muscle inserted and its action?
Beneath what bones does its tendon pass?
What are the deeper muscles of this group?
Describe the origin and insertion of the external pterygoid?
In what direction does this muscle pass?
Describe in like manner the internal pterygoid?
What is the direction of its fibres?
What nerve passes between these two muscles?
Give the action of each muscle of this group?
What nerve supplies these muscles?
Of what nerve is this a branch?
By what foramen does it leave the cranium?

MUSCLES OF THE NECK.

OBLIQUELY ASCENDING GROUP.

What is the first muscle of this group?
Describe its origin, insertion and shape?
Describe in like manner the sterno-cleido-mastoideus?
How wide is this muscle at its origin and insertion?
Where is the third muscle of the group situated?
Give its origin, direction and insertion?
Describe carefully the relation of each one?
What maintains the curved direction of the omo-hyoid?
What is the direction of the two bellies of the muscles?

DIRECTLY ASCENDING GROUP.

Where are the muscles of this group situated?
Which is the most superficial one and its attachments?
Describe the second one of this group?
Give the origin insertion and action of the third one?
Which of them is the longest and which is the widest?
What important structure next beneath?

What separates these different muscles?
What structure beneath the sterno-thyroid?
What nerve supplies these muscles?
What their individual, and combined action?
What operation in the median line between them?

OBLIQUELY DESCENDING GROUP.

Name the four muscles of this group?
Give the origin and insertion of each in order?
Describe more fully the digastric?
What muscle does the tendon of the digastric pierce?
What muscle is parallel to the digastric?
What is in front of these two muscles?
What artery passes immediately beneath them?
What other two are nearly parallel?
What artery passes behind these last two?
What structures in contact with them?
What is the action of each of these muscles?

LINGUAL GROUP.

What muscles are included in this group?
Which one forms the floor of the mouth?
Give its origin, insertion and shape?
What structures cover this first muscle?
What muscle is next deeper than this?
Give the origin, insertion and shape of the genio-hyoid?
What muscle still deeper than the genio-hyoid?
Describe the genio-hyo-glossus and its position?
By what muscle is the tongue protruded?
What is the fourth muscle of the group?
Give its origin, insertion and position?
What muscle descends obliquely to the tongue?
What is the action of the stylo-glossus?
Describe the shape and position of the palato-glossus?
What space is immediately behind it?
Where and what is the lingualis?
Describe more fully its structure and action?
What nerve supplies the muscles of the tongue?

PALATINE GROUP.

Name the five muscles of this group?
What is the position of the azygos uvula?
Where is the palato-glossus muscle situated?
Which of the arches does this muscle form?
Describe the palato-pharyngeus muscle?
What space between the two arches?
Give the origin, insertion and action of levator palati?
Describe in like manner the circumflexus palati?
How are these muscles covered?

PHARYNGEAL GROUP.

Name the five muscles of this group?
Describe the constrictor pharyngeus superior?
Give the origin, insertion and location of the middle constrictor?
Describe in like manner the inferior constrictor?
With what is this continuous below?
What is the location and action of the stylo-pharyngeus?
Describe also the palato pharyngeus?
What is the action of these several muscles in deglutition?
What nerve supplies these muscles?
What other nerve is distributed to the pharynx?
How are these muscles covered in their place?

LARYNGEAL GROUP.

What is the situation of the crico-thyroid?
Give its origin, insertion and action?
Give the attachments of the crico-arytenoideus lateralis?
What is its action upon the larynx?
Where is the crico-arytenoideus posticus situated?
What change in the larynx by its action?
Where is the thyro-arytenoideus situated?
What change in the larynx by its contraction?
Where is the arytenoideus transversus and its action?
Describe the thyro-epiglottideus and its action?
Where is the aryteno-epiglottideus superior?
Describe the aryteno-epiglottideus inferior?
Repeat the origin and insertion of each one?
What nerve supplies the muscles of the larynx?

PRE-VERTEBRAL GROUP.

Name the muscles of this group and their location.
Give the attachments of the rectus capitis anticus major.
Describe the rectus capitis anticus minor.
What are the attachments of the rectus capitis lateralis?
Describe the location and attachments of the longus colli.
What is the action of each muscle of the group?
What parts immediately in front of these muscles?

CERVICO-COSTAL GROUP.

Give the origin and insertion of the scalenus anticus?
Describe in like manner the other scaleni muscles.
Give the position and action of each.
What artery passes between the anticus and medius?
What vessel in front of the scalenus anticus?

COSTAL GROUP.

How are muscles arranged between the ribs?
Describe the external inter-costal.
How do the internal inter-costals differ?
What covers the inner surface of these muscles?
What is the direction of the fibres of each?
What vessels pass between the inter-costal muscles?
Where is the triangularis sterni muscle?
What are its attachments and actions?

MUSCLES OF THE BACK.

What muscles in the first layer on the back?
Describe the first one of these and its action.
Describe in like manner the second one.
What part of the axilla does it form?
What muscles comprise the second layer?
Give the origin, insertion and action of each.
What muscles make the third layer?
What is the attachment of the serratus posticus superior?
Describe the attachments of the serratus posticus inferior.
What is the action of these muscles on the ribs?
What class of muscles next beneath these?

What muscles between the different vertebræ?
What muscles secure the rotation of the head?
Describe the obliquus inferior and its action.
What muscles pass from vertebræ to ribs?
Where are the levatores costarum?
What is the action of the sacro-lumbalis on the ribs?
What relations have the scaleni to the ribs?

MUSCLES OF THE ABDOMEN.

How many and what are the abdominal muscles?
What ones are included in the lateral group?
From what parts does the external oblique arise?
How many serrations, and with what other muscles associated?
Give the direction of its fibres and its insertion.
Where does the muscle end and the tendon begin?
What is meant by aponeurosis?
Describe the tendon and its attachments.
What opening exists in it, and where?
What muscle lies immediately beneath it?
Where does the internal oblique muscle arise?
Describe the direction of the fibres of its different parts.
At what line do the fibres cease?
How is the tendon of this muscle arranged?
Where is it inserted, and what is its action?
What muscle lies beneath this?
Give the origin of the transversalis abdominis?
What is between this and the one last named?
What is next beneath the transversalis muscle?
What is in relation with its borders?
Give the direction of its fibres in different parts.
Where is this muscle inserted?
With what other is its insertion blended?
What and where is the conjoined tendon?
What especial purpose does this tendon serve?
Describe the quadratus lumborum muscle.
What part of the abdominal walls does it form?
What muscles pass vertically on the abdomen?
Which group do these muscles form?

Describe the smaller of the two and its coverings.
Give its origin, insertion and action.
What is the situation of the rectus abdominis?
Give its origin, insertion and action.
Describe the shape of its different portions.
In what way is it enclosed?
What muscles form the sheath of the rectus?
How are these tendons arranged to form the sheath?
What part of the sheath is incomplete, and how?
Describe the abdominal lines and their formation.
What and where are the lineæ transversæ?
Describe the order of super-position in all the abdominal walls.
What forms the upper boundary of the abdominal cavity?
What is the shape of this upper boundary?
Give the origin and insertion of the diaphragm?
Where are the crura of the diaphragm attached?
What parts in relation with its borders?
What is the structure of its central portion?
What openings in the diaphragm, and where situated?
What passes between the crura of the diaphragm?

ISCHIO-RECTAL GROUP.

Where is the levator ani situated?
Give its origin, insertion and shape?
What are its relations to the rectum?
Describe the coccygeus muscle and its use.
Give the origin and insertion of sphincter ani.
What structures cover this muscle?

PERINEAL GROUP.

Where is the erector penis situated?
Give its origin, direction and action.
What muscle corresponds to this in the female?
What muscle surrounds the vagina.
Where is the transversalis perinei situated?
Give its origin, insertion and action.
What muscle encloses the bulb of the urethra?
Give the origin and insertion of the accelerator urinæ.
Describe the compressor urethra and its action.

MUSCLES OF THE UPPER EXTREMITY

GROUP CONNECTING SHOULDER TO BODY.

How many muscles connect the shoulder to the body?
What is the name and position of each?
What muscle conceals the pectoralis minor?
Name carefully its origin, direction and insertion?
What parts immediately beneath the pectoralis minor?
Where is the subclavius muscle situated?
Give its origin, insertion and action.
What vessels immediately beneath it?
Give the origin of the serratus magnus muscle.
What directions do its different portions take?
What is the action of this muscle?
Where does the deep surface of this muscle rest?
What special nerve supplies this muscle?
What is the most superficial muscle of the back?
Give its origin, insertion and action.
What muscles of the group does it conceal?
Where is the levator anguli scapulæ?
Describe its origin, insertion and relations.
Describe the location and attachments of the rhomboideus minor.
Give the attachments and relations of the rhomboideus major.
What is the action of these two muscles?

GROUP CONNECTING ARM TO SHOULDER.

What is the most prominent muscle of this group?
Describe its shape, origin. insertion and action.
What muscle along its anterior border?
What muscles does it conceal, and what joint?
What nerves and vessels beneath this muscle?
Where is the supra-spinatus muscle situated?
Describe its shape, attachments and action.
Describe in like manner the infra-spinatus.
What muscle below the infra-spinatus?
Describe its origin, insertion, shape and action.
What are the attachments of the three last named?
In what direction will they move the humerus?
What muscle below the teres minor?

What is its origin, insertion and action?
What muscle passes between the two teres?
Describe the sub-scapularis, attachments and action.
What is the seventh muscle of this group?
Describe its location and surroundings.
What are its attachments and action?
What nerve passes through the coraco-brachialis?

GROUP CONNECTING ARM TO BODY.

What muscle forms the front of the shoulder?
Describe the pectoralis major and its coverings.
What parts are found along its borders?
Name carefully its origin, insertion and action.
Describe the fibres of its several parts.
What muscles are found beneath this?
What muscle conceals the insertion of the pectoralis major?
What other muscles inserted near this last?
What muscle forms the anterior boundary of the axilla?
What muscle antagonizes the pectoralis?
Describe the position and shape of the latissimus dorsi.
What muscle overlaps its upper border?
What muscles does it cover, and where are they?
Give fully its origin, insertion and action.
What forms the posterior boundary of the axilla?
What muscle inserted near the latissimus dorsi?

MUSCLES CONNECTING FORE-ARM TO SHOULDER.

What muscle of this group on the anterior of arm?
Describe the biceps flexor cubiti, origin and insertion.
What muscle along its inner border?
What structures along the inner side of biceps?
What vessels pass in front of its lower end?
What muscle lies beneath the biceps?
What muscle covers its upper portion?
What is the other muscle of this group?
Describe the shape and location of triceps extensor cubiti.
Name carefully its origin, insertion and action.
What nerve winds around the bone beneath this muscle?
What artery accompanies the musculo-spiral nerve?

GROUP CONNECTING FORE-ARM TO ARM.

What muscles connect the fore-arm to arm?
Describe the origin, shape and insertion of the brachialis anticus.
What is immediately beneath this muscle?
What relation does it bear to the elbow joint?
Where is the anconeus muscle situated?
Give its origin, insertion and shape.
Name the action of these two last named.
What muscles co-operate with them in action?
In dislocation of the fore-arm backwards, what is the degree of flexion?
What muscle prevents the arm being straight?
What one prevents it from assuming a right angle?

MUSCLES OF THE FORE-ARM---19 IN ALL.

What are the primary groups of these muscles?
Name the muscles in the group of short flexors.
What ones in the group of long flexors?
What ones in each sub-division of extensors?
Where is the flexor group situated?
From which condyle do they arise?
On what lines and on what bones are they inserted?
What muscles comprise the pronator group?
Where are the muscles of pronation situated?
Describe the origin, insertion and action of each.
Where is the principal origin of the extensors?
Where are the short extensors inserted, and their action?
What are the long extensors and where inserted?
Name and describe the other three of the extensor group.
What muscles comprise the supinator group?
Where are the supinators found and their attachments?
What muscle passes obliquely across the fore-arm in front?
What muscle is not always present?
What muscle nearly parallel with the radial artery?
What muscle overlaps the ulnar artery at the wrist?
What muscles conceal the supinator radii brevis?
Through what muscle does the median nerve pass?
What ligament on posterior part of wrist to restrain the tendons?
Under what ligament do the long flexor tendons pass?

MUSCLES OF THE HAND.--19 IN ALL.

How many and what groups of these muscles?
Name and illustrate on your hand the action of each muscle.
What muscles on the radial side of palm?
Name the attachments and action of each.
What ones on the ulnar side, and where inserted?
What muscles in the middle of the palm?
Give the origin and insertion of the lumbricales.
How many palmar interossii, and what their attachments?
Where are the dorsal interossii attached?
Which way do these move the digits? From median line.
Which way do palmar interossii move digits? To the median line.

MUSCLES OF THE LOWER EXTREMITY.

GROUP OF FLEXORS OF THE THIGH.

What muscles are included in this group?
How and where is the psoas parvus attached?
What muscle lies immediately beneath this one?
Describe the origin and insertion of the psoas magnus?
What other muscle is associated with this?
Give its origin, direction and place of union with psoas?
What relation do these bear to the head of the femur?
What provision is made there for easy motion?
Where is the insertion of these united muscles?
What covers them as they leave the pelvis?
What lies along their inner edge?
What is by their outer border?
What other action besides flexion of thigh?

GROUP OF EXTENSORS.

What muscles extend the thigh?
Describe the position and shape of the gluteus maximus?
Give its origin, insertion and action?
What is between the gluteus and trochanter major?
What muscles does this one conceal?
What is the principal muscle beneath it?
Give the origin and insertion of the gluteus medius?

Describe the action and use of this muscle.
What different motions does this muscle secure?
What muscle next beneath the gluteus medius?
Describe its shape, attachments and action.
From what part of the ilium does it arise?
What vessels supply this group?
What muscles abduct the thigh?
What muscles act as internal rotators?
What part of the muscles especially does that?
What nerves supply these glutei muscles?
Where do they originate?
Where do they leave the pelvis?
What names do the branches bear?

ROTATOR GROUP.

What muscles are included in this group?
What muscle conceals the group?
Where does the pyriformis arise?
What is its shape, insertion and action?
What nerve leaves the pelvis immediately below it?
What nerves sometimes pierces the muscle?
What muscle next below the pyriformis?
What next below the superior gemellus?
Where does the obdurator internus arise?
Where does it leave the pelvis and where inserted?
What muscle next below this?
Give the origin and insertion of the gemelli.
What muscle next below the gemellus?
Give its origin, direction and insertion?
What muscle next to the external obturator?
Give its origin, shape and insertion?
What is the action of the six last named muscles?
What group do they form, and how move the limb?
What large nerve runs over them?
What smaller nerve and artery cross them?
What muscle next below the quadratus femoris?
Which of the muscles is most concealed?
Repeat again the origin and insertion of these twelve muscles.
Give the position, shape and action of each one.

SUPERFICIAL GROUP ON THE THIGH.

What is the longest muscle in the body?
Describe its origin, direction, position and insertion.
What parts cover it on the thigh?
What superficial muscle arises near it?
Describe the tensor vaginæ femoris.
What are its relations to the fascia lata.
What other muscle connected with the same fascia?
Between what muscles does it arise?
What other superficial muscle on the thigh?
Describe its shape, position and action.
Give the origin, insertion and relations of the gracilis.
What other muscles are inserted near the gracilis?

ADDUCTOR GROUP.

What muscles in the adductor group?
What is the origin, insertion and position of the pectineus?
What is the next in position, of this group?
Give the origin, insertion and shape of adductor longus.
What muscle next beneath this, and its shape?
Give the origin and insertion of the adductor brevis.
Which is the largest muscle of this group?
Describe its origin, insertion and position.
What vessels pierce this muscle, and where?

EXTENSORS OF THE LEG.

Where is this group of muscles situated?
Name the muscles included in it.
Of these, which is the most superficial?
Give the origin and insertion of the rectus femoris.
Describe its shape, position and relations.
What muscle immediately beneath the rectus?
Describe the position and attachments of crureus.
What muscle on the outer side of the crureus?
Describe its shape, origin and insertion.
What muscle on the inner side of the crureus?
What are its attachments and its shape?
Describe the relations of each of these muscles.

FLEXORS OF THE LEG.

What muscles on the posterior part of the thigh?
What ones have a blended origin, and where?
Give the attachments of the semi-tendinosus.
What one is parallel with that, and where attached?
Describe the biceps flexor cruris and attachments.
Name the position and attachments of the popliteus.
What muscles form the inner hamstring muscles?
What forms the outer hamstring?
Under what muscles does the great sciatic nerve pass?
What is found in the popliteal space?
How many and what muscles extend the leg?
How many and what ones flex the leg?

MUSCLES BELOW THE KNEE.

In what groups are they arranged?
How many muscles on the front of the leg?
Which of them make the anterior tibial group?
What one nearest the inner malleolus?
Give the origin and insertion of tibialis anticus.
What muscle is next to that on the outer side?
Give the origin and insertion of the extensor longus pollicis,
Describe the extensor longus digitorum.
Give its origin and insertion.
Describe the remaining one in front.
Under what structure do they pass at the ankle?
What is the superficial muscle on the posterior of the leg?
Give the origin, insertion and shape of the gastrocnemius.
What passes over the centre of the muscle.
What muscles underneath the gastrocnemius?
Give the origin, insertion and relations of the plantaris.
What large muscle still deeper?
Describe the soleus and its relations.
What muscles form the superficial posterior group?
What ones comprise the deep posterior group?
What nerve and vessels between the two groups?
Behind which malleolus does the deep group pass?
Describe the tibialis posticus and its surroundings.

Give the origin and insertion of the flexor longus pollicis.
What other muscle of this group, and where attached?
How are the tendons of these muscles arranged in the foot?
What are the remaining muscles of the leg?
Describe the origin, insertion and action of the peronei.
What relation have they to the outer malleolus?
What nerve pierces the head of the peroneus longus?
Name the muscles in each of the four groups.
What is the total number below the knee?

MUSCLES OF THE FOOT.

How many muscles on the foot?
Name and describe the three in the superficial group.
What muscles comprise the second group?
Give the origin, insertion and relations of each.
Which is the largest of the five?
What muscles make the deep group?
Where is the flexor brevis pollicis situated?
Where is the adductor pollicis?
Where is the transversalis pedis located?
What and where is the fourth muscle of this group?
How many plantar interossei, and where inserted?
How many dorsal interossei, and where situated?
What other one on the top of the foot?
What is the origin and insertion of the extensor brevis digitorum.
What structure superficial to the first group of muscles?
Describe the situation, structure and use of the plantar fascia.
How many tendons of the leg pass the malleoli to the foot?
How many and what tendons between the malleoli in front?
What is their order from the inner to the outer side?
How are they held in position at the ankle?
Do they pass in one or in different sheaths?
How many and what tendons behind the inner malleolus?
Of these, which lies first behind the malleolus?
What tendons pass behind the outer malleolus?
Which of these crosses the sole of the foot?
What tendon in the middle posteriorly?
What muscles unite to make the tendo Achilles?

THE CIRCULATORY SYSTEM.

OF THE HEART.

What position does the heart occupy?
What structures in front and behind it?
What parts lie on each side of it?
What structures above and below the heart?
What membrane invests the heart?
What does it enclose besides the heart?
What are the properties and purpose of this membrane?
How is the heart placed within the pericardium?
What portion of the heart lies most to the right?
What part lies mostly in front?
Where is the left auricle situated?
What position does the left ventricle occupy?
What is the average length of the heart?
How wide is the heart, moderately filled?
What is the usual thickness of the heart?
How many valves pertain to the heart?
Where is the coronary valve situated?
Where and for what purpose is the Eustachian valve?
What valve between the right auricle and ventricle?
Describe its structure and action.
Where is the mitral valve placed?
What other valve does it resemble?
How large are the openings closed by these valves?
Where are the semilunar valves placed?
What is the circumference of the orifice which they close?
What difference is observed in their structure?
What is the lining membrane af the heart?
What other tissue forms the valves?
What is the structure of the ventricles?
How are the muscular fibres arranged?
What is the comparative thickness of the walls?
What is the difference in the walls of the auricles?
What openings into the right auricle?
What remains of fœtal life in this auricle?
What openings into the left auricle?

DISTRIBUTION OF ARTERIES.

What branches arise first from the aorta?
Where are they distributed?
Describe their origin and position on the heart.
Describe the shape and position of the arch of the aorta.
What branches arise from the arch of the aorta?
Describe the direction, length and branches of the innominata.
Describe the primitive carotid on each side.
Where and into what does the primitive carotid divide?
Why are they called external and internal?
What three branches from the external carotid anteriorly?
What is the first branch from the external?
What is its direction and what branches?
Where is the superior thyroid distributed?
What is the second branch and its direction?
What branches and parts of the lingual artery?
To what parts are they distributed?
What is the third branch from the carotid?
What branches from it below the inferior maxilla?
To what part is each one distributed?
What branches from the facial on the face?
With what does the inferior labial anastomose?
What arteries surround the mouth?
With what does the angular branch anastomose?
What three arteries from the carotid posteriorly?
What is usually the first one, and where distributed?
What branches from the occipital artery?
Where is it principally distributed?
What artery from the carotid near the occipital?
Where is the posterior auricular distributed?
Into what does the carotid then divide?
What direction does the temporal take?
What branches arise from the temporal?
Into what terminal branches does it divide?
With what do its branches anastomose?
What direction does the internal maxillary take?
Name its principal branches.
Which ones become superficial on the face?

OF THE INTERNAL CAROTID.

Where is the internal carotid artery distributed?
Through what foramen does it enter the cranium?
What is the first considerable branch?
Through what foramen does it enter the orbit?
Name the branches of the ophthalmic artery.
Which one anastomoses with the facial?
What is the second branch of the internal carotid?
Where is the anterior cerebral distributed?
What communication between the two?
Where is the middle cerebral distributed?
What branch from the carotid running backwards?

OF THE SUBCLAVIAN AND ITS BRANCHES.

Where do the subclavian arteries arise?
Describe the three parts of each subclavian artery.
How do the two differ inside the first rib?
What is the first branch from the subclavian?
Describe the course of the vertebral to the brain?
What branches as they enter the foramen magnum;
What large branch before they unite?
How is the basilar artery formed, and where?
What branches from the basilar artery?
What union between it and the carotid?
How is the circle of Willis formed?
What purpose does it serve in the circulation?
What arteries supply the pia mater and brain?
What arteries supply the dura mater?
What is the second branch from the subclavian?
How long is the thyroid axis, and where situated?
What branches arise from the thyroid axis?
Name the direction and distribution of each.
What branches from the subclavian going down?
What is the general direction of the internal mammary?
Name its principal branches and anastomoses.
Where is the superior intercostal distributed?
What other branch from the subclavian?
What six branches from the axillary artery?

Where does the achromial thoracic go for distribution?
Name the distribution of the superior or short thoracic.
Where is the long thoracic distributed?
Describe the subscapular and its branches.
What is the origin and distribution of the circumflex?

OF THE BRACHIAL ARTERY AND ITS BRANCHES.

Name the four principal branches from the brachial.
What becomes of the superior profunda?
Name the origin and distribution of the inferior profunda.
Where is the anastomotica situated?
With what arteries do these branches anastomose?
Where does the brachial artery usually divide?
When is it said to have a high bifurcation?
What is the course of the radial from its origin?
What does the recurring radial join?
What branches from radial on the fore-arm?
What branch just above the wrist?
What becomes of the superficialis volæ?
What position does the radial occupy at the wrist?
What other branches to thumb and fingers?
What finally becomes of the radial artery?
Where is the deep palmar arch situated?
What branches from it to the fingers?
With what other arteries do they join?
What branches from the ulnar turn upwards?
With what others do they anastomose?
What branches from the ulnar in the fore-arm?
Where is the interosseal artery distributed?
Where does the ulnar enter the hand?
How is the palmar arch formed?
In what part of the hand is it situated?
What branches from it to the fingers?
How are these branches situated in the hand?
On what part of the fingers are the digital arteries?
What artery supplies the deep palmar arch?
Which forms the superficial palmar arch?
What communication between the two arches?

OF THE THORACIC AORTA AND ITS BRANCHES.

What position does the thoracic aorta occupy?
What branches from the aorta to the lungs?
How many œsophageal arteries?
How many intercostal arteries?
What is their position and distribution?
With what do the intercostals anastomose?

OF THE ABDOMINAL AORTA.

What position does the abdominal aorta occupy?
What is the first branch from it?
To what part is that distributed?
What is the second branch from the abdominal aorta?
What are the branches of the cæliac axis?
Where is the gastric branch distributed?
What branches from it to other parts?
What is the direction and distribution of the splenic?
What branches from the splenic on its way?
What is the direction of the hepatic artery?
What are its principal branches, and where distributed?
What large anastomosis does it form with splenic?
In what regions are the branches of the cæliac distributed?
What artery next below the cæliac axis?
Where is the superior mesenteric distributed?
What branches are especially named?
How much of the colon do they supply?
What arteries next to the mesenteric?
Where are the supra renal distributed?
Where do the renal arteries arise?
What arteries next to the renal?
Where are these distributed in each sex?
How is the length of the spermatic explained?
What artery next below the spermatic?
Where is the inferior mesenteric artery distributed
How many lumbar arteries are there?
Where are the lumbar arteries distributed?
Where does the aorta divide, and into what?
What artery is properly a continuation of the aorta?

OF THE ILIAC ARTERIES AND THEIR BRANCHES.

Where do the iliac arteries divide?
What course does the internal iliac take?
What are its principal branches?
What large one in fœtal life?
Where is the ilio-lumbar artery distributed?
Describe the distribution of the lateral sacral?
Where is the middle hemorrhoidal distributed?
What becomes of the obturator artery?
Where does the gluteal artery leave the pelvis?
To what parts is it distributed?
Where are the uterine, vaginal and vesical distributed?
What arteries supply the rectum?
What is the course of the internal pudic?
What parts are supplied by its branches?
What to the rectum, and to what part of it?
What artery crosses the perineum?
Where are its terminal branches distributed?
What branches arise from the external iliac?
Where is the internal circumflex ilii distributed?
What becomes of the internal epigastric?
What irregularity in the origin of the obturator?
What course does the obturator artery take?
Where does the external iliac leave the pelvis?

OF THE FEMORAL AND ITS BRANCHES.

Name the superficial arteries from the femoral.
To what part is each one distributed?
Where does the profunda femoris arise?
Describe its general direction and distribution.
What branches arise from the profunda?
What becomes of the circumflex arteries?
How many perforating branches, and where distributed?
Where is the femoral artery situated?
What and where is the last branch from it?
Where is the anastomotica distributed?
What position does the popliteal artery occupy?
What branches from the popliteal artery?

Where are they distributed?
Into what arteries does the popliteal divide?
At what point does the division occur?
What is the course of the anterior tibial?
What branches arise from it in the leg?
What position does it occupy on the foot?
What branches from it on the foot?
What becomes of its terminal branch?
What is the direction of the posterior tibial?
What are its branches above the foot?
Where is the peroneal artery distributed?
Where is the tibial artery situated at the foot?
What name do its branches take in the foot?
What arrangement have they in the foot?
What branches from the plantar arch to the toes?
Where is the anastomosis between anterior and posterior tibial?
What anastomoses of arteries occur around the knee?
In ligature of the popliteal, how is the leg supplied?
In ligature of the femoral, what branches supply it?
In ligature of external iliac, what vessels supply the leg?
In ligature of the carotid, how is the face supplied?
In ligature of the subclavian, how are the parts supplied?
In ligature of the axillary, what vessels supply the arm?
If the brachial be tied, how is the fore-arm supplied?
Why must a wounded radial or ulnar be tied on both sides?
What arteries anastomose below the orbit?
What anastomose above the orbit, and what on the inner side?

OF THE VEINS OF THE BODY.

Through what channels is the blood returned to the heart?
What is the first division of the veins of the body?
Do the superficial veins have arteries accompanying them?
How deep are the superficial veins usually situated?
How many veins usually accompany the smaller arteries?
What names do these deep veins usually bear?
How many veins accompany the large arteries?
Where do the superficial and deep veins communicate?

VEINS OF THE HEAD AND NECK.

What veins on the anterior part of the head and face?
How are the frontal veins connected and located?
Describe the course and termination of the facial vein?
What veins on the side of the head?
What veins unite to form the external jugular?
Where do the external jugular veins terminate?
What other superficial veins on the neck?
What provision for venous blood within the cranium?
How are these sinuses formed?
What ones are named and where situated?
Where does the superior longitudinal sinus commence?
Where is the inferior longitudinal sinus located?
Where do the lateral sinuses terminate?
What veins receive the blood from these sinuses?
Where are the jugular veins situated?
Where do the internal jugular veins terminate?

VEINS OF THE UPPER EXTREMITY.

What are the principal superficial veins on the fore-arm?
Describe the position of each one named.
What veins unite to form the cephalic?
Where does the cephalic vein terminate?
What position does it occupy on the arm?
What veins form the basilic, and where is it placed?
Where does the basilic vein terminate?
Describe the median vein and its branches?
What vein is usually opened in venesection?
Which is the preferable one, and for what reason?
What other veins deeper on the fore-arm?
What deeper vein above the elbow?
Where do the superficial and deep veins communicate?
What becomes of the brachial vein?
What veins empty into the axillary vein?
What position does it occupy in the axilla?
What name does this vein next take?
What is the position of the subclavian vein?
What large vein unites with the subclavian?

What other veins join the subclavian?
What vein is formed by the left subclavian and the jugular?
What position does this vein occupy?
What vein is formed by right subclavian and internal jugular?
How long is the vena innominata. and where placed?
What vein is formed by the transverse and innominata?
How long is the descending vena cava?
Where is the descending vena cava situated?
Where does this vein terminate?
What vein joins the descending vena cava?
What veins unite to form the vena azygos?

VEINS OF THE LOWER EXTREMITY.

What veins below the knee are named?
Describe the commencement and course of internal saphenous.
Where does the external saphenous commence and end?
What vein in front of the inner malleolus?
What one behind the outer malleolus?
What veins accompany the arteries?
What superficial vein above the knee?
Where does this vein terminate?
Where is it situated at the knee?
What large vein behind the knee?
What are its relations to the artery?
What vein accompanies the femoral artery?
Which of the vessels is most superficial?
What veins join the femoral at its upper part?
With what vein does it become continuous?

OF THE VEINS OF THE ABDOMEN.

What do the iliacs form by uniting?
What veins return the blood from the pelvis?
What veins open into the vena cava?
Where is the ascending vena cava situated?
Where does it terminate?
What veins unite to form the portal vein?
Where is this vein situated?
Describe each vein aiding to form it?
What peculiarity exists in the portal veins?

Where do the portal and systemic veins communicate?
Where does the portal blood go, and its purpose?
By what channels does this blood reach the heart?
Are there valves in the hepatic veins?
What peculiarity in the portal circulation?

PULMONARY CIRCULATION.

What vessels carry blood to the lungs?
Where does the pulmonary artery arise?
What kind of blood circulates through it?
On which side of the aorta is it at its origin?
How long is the artery before the division?
How are its branches arranged?
What is their ultimate distribution?
What vessels return the blood to the heart?
What kind of blood do they carry?
What portion of the heart receives it?
How many pulmonary veins for each lung?
Have they valves like other veins?

FŒTAL CIRCULATION.

What peculiarities exist in the fœtal heart?
What is the object of the foramen ovale?
Describe its position and the permanent remains of it.
In what manner and at what time is it closed?
Where is the Eustachian valve situated?
Where and what is the ductus arteriosus?
What is the purpose of this vessel?
What becomes of it after respiration is established?
By what vessels does the blood reach the placenta?
Where do the umbilical or hypogastric arteries arise?
Describe their course to the umbilicus.
What vessel returns the blood to the fœtus?
Where does the umbilical vein terminate?
What vessel in the fœtal liver afterwards closed?
Describe the position and use of the ductus venosus?
Trace the course of the adult circulation.
Trace the course of the blood in fœtal circulation.
Does the blood pass from the fœtus to the mother?

QUESTIONS ON THE NERVOUS SYSTEM.

MEMBRANES OF THE BRAIN.

What membranes envelop the brain?
What is the character of the dura mater?
What is the falx cerebri and what is its extent?
What and where is the tentorium?
What and where is the falx cerebelli?
What purpose do these structures serve?
What connection between dura mater and skull?
What cavities are found within the dura mater?
How are they formed, and for what purpose?
Name the principal sinuses and their position.
What and where is the arachnoid membrane?
How extensive is the arachnoid and what is its structure?
Describe its layers and their attachments.
What and where is the pia mater?
Describe its structure and position.
What purpose does it serve?
What vessels supply the dura mater?
At what place do these arteries enter the skull?
What arteries supply the pia mater?
Where do they enter the cranium?
What branches are named within the cranium?
What and where is the circle of Willis?
What is the purpose of this arrangement?
Do the vessels of dura mater and pia mater freely communicate?

OF THE BRAIN.

What is meant by encephalon?
What does the term brain include?
What is meant by cerebro-spinal axis?
What is meant by the cerebro-spinal system?
How is the cerebrum divided?
How is each hemisphere divided?
Is the line of separation into lobes clearly shown?
How are the lobes divided?
How are the convolutions formed?

Of what structures are they composed?
How many varieties of neurine in them?
What are the characters of each?
What is the position of each in the brain?
What is their position in the spinal cord?
What separates the hemispheres?
What connects the hemispheres?
What are commissures?
What are the principal commissures of the brain?
What is their structure and object?
What is the extent of the corpus callosum?
What does the corpus callosum connect?
Where is the anterior commissure, and what does it connect?
Where is the middle commissure situated?
Describe the position and connection of the posterior commissure.
How large are those commissures?
What are ventricles, and how are they formed?
How many and what ventricles in the brain?
What kind of membrane lines them?
How extensive are the lateral ventricles?
What is above the lateral ventricle?
What forms the floor of these ventricles?
What is the corpus striatum, and where is it situated?
What and where are the thalami optici?
By what other name are they known?
Where does the anterior cornu of the ventricle terminate?
Where does the posterior cornu terminate?
Name the direction and extent of the middle cornu.
What projects into this middle cornu?
Where is the pineal gland situated?
Where are the corpora quadrigemina?
By what other names are they known?
What is their shape and size?
What and where is the valve of the brain?
Where is the septum lucidum situated?
What is its structure, and how thick?
Where is the fifth ventricle situated?
Does the fifth ventricle communicate with the third?

What is below the septum lucidum?
What is the nature of the fornix?
What names are given to its different parts?
What cavity below the fornix?
What are its lateral boundaries?
What and where is the choroid plexus?
What and where is the velum interpositum?
Where is the fourth ventricle situated?
With what other one does it communicate?
What is the channel of communication called?
What opening from the third to the lateral ventricle?
Can the ventricles be exposed without dividing neurine?
Where is the fissure of Sylvius and its extent?
How deep are the sulci of the cerebrum?
How extensive are the convolutions or gyri?
Are they symmetrical on the two hemispheres?
In what fossæ does the cerebrum rest?
What separates it from the cerebellum?
Where is the cerebellum situated?
How is it divided, and what covers it?
What parts of it are named, and where situated?
With what is the cerebellum connected?
What and where are the crura cerebri?
What do they connect, and what is their structure?
Where are the crura cerebelli, and what do they connect?
What is the structure of the cerebellum?
What and where is the pons varolii?
Where is the medulla oblongata?
Name its general shape and position.
How is it connected, and how divided?
Where are the corpora pyramidalia situated?
Describe the shape and position of the corpora olivaria.
Where are the corpora restiformia?
Where are the posterior pyramidal bodies?
What and where is the sub-arachnoidean space?
Where is it best exhibited?
What occupies that space in the normal state?
What is the character of the sub-arachnoid fluid?

OF THE CRANIAL NERVES.

How many cranial nerves?
Name each in proper order from before, backwards.
Where is the olfactory nerve situated?
Name its place of exit and distribution?
Where does the optic nerve arise?
Describe its direction and place of exit.
Where is the optic nerve distributed?
Where does the third nerve arise?
Where does this nerve leave the cranium?
To what muscles are they distributed?
Name the origin and distribution of the fourth.
By how many roots does the fifth nerve arise?
What are its divisions within the cranium?
Name the place of exit for each branch.
Name the principal branches of the ophthalmic.
Describe their distribution and function.
What is the second division of the trifacial?
Name its principal branches and their distribution.
Which division of the trifacial is the largest?
Where does this branch leave the cranium?
Where does the gustatory nerve arise?
What are the principal branches of the inferior maxillary?
What becomes of the mental nerve?
Where does the sixth nerve arise?
Name its exit and distribution.
Name each of the nerves that enter the orbit.
What is the origin of the seventh nerve?
By what different names is it known?
Describe its place of exit and distribution.
What power does it confer on the parts supplied?
Do its fibres blend with the trifacial?
Where does the eighth nerve arise?
To what portion of the ear is it distributed?
Where does the ninth nerve arise and leave the cranium?
Where is the ninth nerve distributed?
What power does it impart to the region supplied?
By what different names is the tenth nerve known?

Where does this nerve arise and leave the cranium?
What are its principal branches high in the neck?
What branch lower in the neck?
Where are these branches distributed?
What branches in the thorax, and where distributed?
Where is its abdominal portion distributed?
State clearly the distribution of all its branches.
Name the origin and distribution of the eleventh nerve.
Where does the twelfth nerve arise and leave the cranium?
Describe its distribution and function.

SPINAL CORD.

Where is the spinal cord situated?
How is the spinal canal formed?
What openings from the canal, and how formed?
What membranes envelop the spinal cord?
What separates the dura mater from the vertebræ?
What are the attachments of the theca vertebralis?
How does this differ from the dura mater cerebri?
Describe the character and position of the arachnoid.
In what manner is it connected to the other membrane?
Describe the structure and position of the pia mater.
How does it differ from the pia mater of the brain?
Describe the space between the arachnoid and pia mater.
What occupies that space, and for what purpose?
How far down does the spinal cord extend?
What difference exists in different ages?
How is the spinal cord divided?
How is it divided longitudinally?
How deep are the longitudinal fissures?
How is the vesicular neurine arranged?
How is the fibrous neurine situated?
How is each lateral half of the cord divided?
How do the nerves arise from the cord?
Where and in what manner do they emerge from the cord?
How are the roots of the nerves situated?
How are these roots separated while in the sheath?
What is the function of these roots respectively?

Where do the roots unite for a common nerve?
How long are the roots before they unite?
Which of these roots has a ganglion upon it?
Where is that ganglion situated?
Describe the course of the roots in different regions.

OF THE SPINAL NERVES,

How many spinal nerves?
How are they divided by regions?
What is the comparative size of anterior and posterior roots?
Where do the roots unite?
Where do these spinal nerves leave the canal?
How many cervical nerves?
What becomes of the first four of them?
Name the distribution of the principal ones.
Describe the origin and distribution of the phrenic.
What becomes of the last four cervical?
What other nerves unite with them?
What is formed by this union of five nerves?
Where is the axillary plexus situated?
Name the five branches passing down the arm.
What becomes of the supra-scapular nerve?
Describe the posterior or long thoracic.
By what other name is it sometimes known, and why?
What is the distribution of the sub-scapular nerve?
Describe the course and distribution of the circumflex.
What becomes of the external cutaneous?
What muscle does it pierce, and what does it pass under?
Where is the internal cutaneous nerve distributed?
Describe the course and distribution of the ulnar nerve.
Where may it be found at the elbow?
Trace the course and distribution of the median nerve.
Where does the nerve enter the hand?
What becomes of the musculo-spiral nerve?
Where is it situated at the bend of the arm?
Where are its branches distributed?
How many digits does the median nerve supply?
How many and what ones are supplied by the ulnar nerve?

OF THE DORSAL AND LUMBAR NERVES.

How many dorsal nerves?
What becomes of the first dorsal nerve?
How are the next ten distributed?
What becomes of the last dorsal nerve?
How many lumbar nerves?
How many and what nerves form the lumbar plexus?
Where is that plexus situated?
What nerves arise from the lumbar plexus?
Where are the cutaneous branches distributed?
What becomes of the obturator?
Which is the largest nerve from the lumbar plexus?
Where does it leave the abdominal cavity?
What are the principal branches of the anterior crural?
Where is the long saphenous distributed?
What becomes of the short saphenous?
Where are the cutaneous branches distributed?
What part of the thigh does the lumbar nerve supply?

OF THE SACRAL NERVES.

How many sacral nerves?
What nerves form the sacral plexus?
Where is it situated?
What are the principal nerves from this plexus?
Where are the gluteal nerves distributed?
By what opening do they leave the pelvis?
What becomes of the pudic nerve?
Where is the small sciatic nerve distributed?
Where does the great sciatic nerve leave the pelvis?
What are its principal divisions?
What is the course of the peroneal nerve?
To what part of the leg is it distributed?
Describe the course of the popliteal nerve?
Where is the posterior tibial nerve distributed?
Where is it situated on the leg?
Where is it located at the ankle?
What are its branches in the sole of the foot?
Where do they finally terminate?

QUESTIONS ON SURGICAL ANATOMY.

Name the three important hernial regions?
At what period does umbilical hernia usually occur?
What circumstances favor its occurrence?
Name the anatomical peculiarities worthy of notice.
How are we secured against hernia here?

INGUINAL HERNIA.

In what region does this variety of hernia occur?
What is the extent of the inguinal region?
What makes this a region of so much interest?
In what region is the testis developed?
At what period does its change of location commence?
What is the gubernaculum testis?
What appears to be its situation and office?
At what time does the testis usually reach the scrotum?
What change then occurs in the abdominal walls?
What deficiency sometimes exists at birth?
What variety of hernia is likely to result from that fact?
Does the testis ever fail to reach the scrotum?
Where is it found arrested in its descent?
What physiological reason for the descent of the testis?
By what openings does the testis reach the scrotum?
In what structures do these openings exist?
What structures exterior to the external oblique muscle?
In what structure is the external abdominal ring situated?
How far is the ring from the median line of the body?
How is the external abdominal ring surrounded?
What structure covers the cord as it emerges at the ring?
Describe the inter-columnar fascia?
What other opening, and in what structure is it situated?
Describe the location of the internal abdominal ring.
What space between the two abdominal rings?
What is its length and direction?
What occupies this inguinal canal?
What forms its anterior boundary?
What forms the superior boundary of the canal?
How is it bounded posteriorly?

What forms its lower boundary?
What are the components of the spermatic cord?
Which of these structures pass through the internal ring?
What artery is of interest in this region?
What is the origin and direction of the internal epigastric?
What is its position with regard to the rings?
In what structure is the internal ring formed?
What protects the ring from more frequent hernia?
How is the external ring protected?
How do direct and indirect hernia differ?
What is understood by concealed inguinal hernia?
What structure is behind the internal ring?
Does any part of the cord perforate the peritoneum?
Trace its parts inwards from the internal ring.
What are the ordinary structures to cover direct hernia?
What the ordinary coverings of an indirect hernia?

OF FEMORAL HERNIA.

Where does femoral hernia occur?
What are the boundaries of the femoral region?
What structure next beneath the integument?
What opening exists in the fascia lata?
Describe the structure internal to that opening.
Describe the iliac portion of the fascia lata.
What is the falciform border, and to what united?
What is the direction of Poupart's ligament?
What and where is Gimbernat's ligament?
How are these affected by flexing or abducting the thigh?
What parts pass beneath Poupart's ligament?
In what part of the crural arch does hernia occur?
What name is given to this space?
How large is the femoral ring, and what closes it?
What structures on each side of the femoral ring?
What closes the saphenic opening in the fascia lata?
How is the sheath of the femoral vessels formed?
How and where is the femoral canal formed?
What artery sometimes concerned in femoral hernia?
Describe its origin and position when formed?

SURGICAL ANATOMY OF THE NECK.

What are the quadrilateral boundaries of the neck?
What muscle divides it into two triangles?
Name the boundaries of the triangles thus formed?
What muscle divides each of these triangles?
Name and bound each of the four angles thus formed.
What operation is made in the subclavian triangle?
What structures cover the subclavian artery?
What veins are found in this triangle, and how situated?
How many stages of this artery are recognized?
What is its direction in the first stage?
What arteries arise from it inside the scalenus muscle?
Why is not the artery ligated in this stage?
What important vein in front of it?
What important vein crosses it, and where?
What muscles conceal it inside of the scalenus anticus?
What is meant by the second stage of the artery?
What muscle conceals this part of its course?
Does it give off any branches behind the scalenus?
What is the direction of the artery in its third stage?
Does this part of the artery give off branches?
What vein lies in front of the artery here?
What nerves lie near it, and where are they?
Where is the preferable place to ligate the artery?
How is the arm then supplied with blood?
What branch sometimes arises from this part of the artery?
How is that likely to affect the operation?
Is there any regular operation in the omo-trapezian triangle?
What glands does this triangle contain?
What vessels are found in that triangle?
What nerves pass across that space?
What is the most frequent operation performed in it?
Describe the course of the external jugular vein.
What parts bound the inferior carotid triangle?
How does it compare in size with the superior carotid triangle?
What muscles lie over the artery in this angle?
What is the direction of the anterior belly of the omo-hyoid?

What immediately invests the carotid artery here?
How is this investing sheath formed?
What else is included within the sheath?
What relation do these parts bear to each other?
What is internal to the carotid artery in this angle?
What muscle must be divided properly to reach the artery?
Describe the structures requiring division to reach the artery.
What structures bound the superior carotid triangle?
What structures cover the artery in this triangle?
Describe the superficial fascia of the neck.
Describe the platysma myoid muscle.
What relation has this muscle to the external jugular vein?
What other fascia invests the neck beneath this?
Describe fully this deep cervical fascia.
What relation does it bear to the muscles?
What besides muscles does it envelop?
What name does it take while enclosing vessels?
What passes down in front of the carotid sheath?
Where does the descendens noni have its origin?
What nerve joins it, and from what source?
Where are the branches of this nerve distributed?
What does the carotid sheath enclose?
What relations have these structures to each other?
How is the pneumogastric separated from the artery?
What nerve is behind the carotid sheath?
What veins at the upper portion of this triangle?
Describe the course of the superior thyroid artery.
Describe the surgical relations of the inferior thyroid.
Where is the operation of laryngotomy performed?
Between what cartilages is the opening made?
What membrane fills the space, and how wide?
What vessels are likely to be involved in this operation?
What structures are divided to reach the membrane?
Between what muscles is the operation made?
Where is tracheotomy performed?
What covers the trachea at its upper part?
Describe the size and position of the thyroid gland.
How wide is that portion in front of the trachea?

What arteries supply the thyroid gland?
Are any of them involved in tracheotomy?
What structures are divided in this operation?
Between what muscles is the operation made?
What veins are found in front of the trachea?
Why do we not remove the thyroid gland?
Where is œsophagotomy performed?
What vessels are likely to be involved in it?
What nerves are in the vicinity of the operation?
Describe the position of the œsophagus.
What triangle immediately below the inferior maxilla?
Describe the boundaries of the submaxillary triangle.
What is contained within this triangle?
What gland is situated here, and how is it covered?
What artery passes through this triangle?
Describe its relation to the submaxillary gland.
Where does the excretory duct of this gland terminate?
What other glands are contained in this region?
Where are the sublingual glands situated?
Describe the boundaries of the parotid region.
What is contained within these boundaries?
How far in each direction does the parotid gland extend?
Where is the deepest portion situated, and how deep is it?
What structures cover the parotid gland?
What glands in relation with this, and where?
What separates this gland from the submaxillary?
Describe the course and termination of the duct of Steno.
What rule for finding it where it crosses the face?
What artery enters the parotid gland, and where?
What arteries pass from the gland, and where?
What veins enter, and where do they leave the gland?
What nerve enters the gland at its deep portion?
What other nerve enters the gland to unite with this?
What plexus is formed by the portio dura, and where?
Where are the branches of this nerve distributed?
Does a diseased lymphatic gland ever encroach upon the parotid?
To what extent may it occupy the place of the parotid?
Describe the boundaries of the buccal cavity.

What cavity or space immediately behind this?
Describe the structure of the soft palate.
What arches descend from the soft palate?
What muscles form those arches?
What is the shape of the space between the arches?
What organ is contained within the fauces?
Describe the position and structure of the tonsils.
What vessels supply the tonsils?
What plexus of veins is found near there, and where?
What muscle is exterior to the tonsils?
How do enlarged tonsils affect the hearing?
What is the next space behind the fauces?
What is the shape and extent of the pharynx?
Describe its muscles and its lining membrane.
What openings at the upper part of the pharynx?
Where is the opening of the Eustachian tube situated?
How is this opening reached with instruments?
What is its size and structure to the middle ear?
What opening from the lower part of the pharynx?
Describe the parts around the glottis.
What is the shape of the posterior nares?
What is the direction of the lower meatus of the nose?
What opening into it from above, and how large?
How far from the anterior nares does the nasal duct open?
What is the size and position of the nasal duct?
Where is the lachrymal sac situated?
What is its size and extent?
What parts cover this sac on the face?
What openings into the upper part of the sac?
What occasion have we for opening into the sac?
Where is the opening made, and what is divided?

OF THE AXILLA AND ARM.

What muscles bound the axillary space?
Describe the relations of the pectoralis major to that space.
Describe in like manner the pectoralis minor.
How is the latissimus dorsi situated?
What artery passes out above the pectoralis minor?

What are the branches of the axillary artery?
What relation does the axillary vein bear to the artery?
What relations have the nerves of the axilla to the artery?
What nerves from this plexus pass down the arm?
How is the median nerve formed?
What difficulties attend ligating the artery?
What artery from this region to the mammary gland?
What glands in the axilla, and how situated?
Where is the brachial artery situated?
On what muscles does this artery rest?
What muscle parallel on the outer side?
What nerves accompany the brachial artery?
What is the position of the median nerve?
What veins accompany the brachial artery?
How are they arranged with reference to the artery?

OF THE BEND OF THE ARM AND THE FORE-ARM.

What veins are in front between the condyles?
What veins unite to form the cephalic vein?
Trace its course to its termination.
Has it any especial surgical interest?
What becomes of the ulnar veins?
Trace the course and termination of the basilic vein.
What vein usually along the middle of the fore-arm?
How is this vein arranged at the bend of the arm?
Give the names and position of its branches.
Which branch has nerves in front of it?
Where does a deep vein communicate with it?
What superficial nerves in this region?
Where are the branches of the external cutaneous situated?
Are they liable to be wounded in venesection?
Where is the internal cutaneous nerve situated?
Where are its branches found at the bend of the arm?
What structures cover these superficial veins?
What artery is found in this region?
Which branch of the median vein in front of it?
What lies between the vein and the artery?
What thickness of structure usually between them?

What large nerve near the artery in this region?
How far apart, and on which side is the nerve?
Which vein will ordinarily bleed best, and why?
Which vein is best and safest for venesection?
State clearly the anatomical facts deciding it.
Why will not a radial or ulnar vein bleed well?
What covers the radial artery from elbow to wrist?
Describe its course from the bifurcation of the brachial.
Where is the radial artery reached for ligation?
What will be divided to reach its middle?
What nerve accompanies the radial artery, and how far?
On which side of the artery is the nerve situated?
Where is the radial artery found below the radius?
Which palmar arch is formed by the radial?
Where does it enter the palm of the hand?
With what do the branches from this arch unite?
What course does the ulnar artery take in the fore-arm?
What muscle covers it along the lower half?
What nerve accompanies the ulnar artery?
What portion of its course, and on which side of it?
Where do the artery and nerve enter the hand?
Describe the position of the superficial palmar arch.
What structure in the palm over the artery?
Where are the digital arteries situated?

OF THE ANATOMY OF THE PERINÆUM.

What is the extent of the perinæal space?
Describe the line which divides it into triangles.
What are the boundaries of the anterior triangle?
Describe the boundaries of the posterior triangle.
What is contained in the anterior triangle?
What structure next beneath the skin?
With what is this superficial fascia continued?
Describe the superficial perinæal fascia.
What muscles are exposed in removing it?
How is the penis divided, and to what is it attached?
Describe the structure of the corpora cavernosa.
Describe the form and position of the crura.

What position does the urethra occupy?
What structure surrounds the urethra?
Where is this structure most abundant?
What name is given to its posterior portion?
Describe the shape and position of the bulb.
What portion of the urethra is next behind the bulb?
What portion is still posterior to it, and how long is it?
What muscles cover the bulb of the urethra?
Give the origin and insertion of these muscles.
Describe their shape, position and action.
What muscle covers the crus of the penis?
Describe the erector penis and its action.
What muscle crosses the perinæal space?
Describe fully the transversalis perinæi.
What vessel and nerve parallel with this muscle?
Where is the lateral operation of lithotomy made?
Between what muscles is the incision carried?
What portion of the urethra is opened?
Where is the membranous portion of the urethra situated?
What structure invests the urethra there?
Through what fascia does this portion of the urethra pass?
What is contained in the posterior perinæal triangle?
What muscle first beneath the skin?
Describe the superficial sphincter ani.
What muscle is internal to that sphincter?
How are the longitudinal fibres of the rectum arranged?
What arteries supply the lower end of the rectum?
What veins are here, and with what do they communicate?
What becomes of the inferior mesenteric veins?
Do these veins communicate with branches of the iliac?
Wherein do these veins differ from the superficial ones?
To what pathological conditions are they subject?
What fills the ischio-rectal fossa?
What disease is liable to occur here?
What arteries are involved in the operation for fistula?
Where is the recto-vesical operation of lithotomy made?
Describe the structure and position of the prostate gland.
What is at the base of the bladder behind the prostate?

Describe the shape and position of the seminal vesicles.
To what extent are the bladder and rectum united?
What is between the prostate gland and the rectum?
In what way can the prostate gland be examined?
How far from the verge of the anus can it be felt?
What structures envelop the testicle?
What surgical interest has the tunica vaginalis?
Describe its relation to the testis and cord.
What parts contribute to form the spermatic cord?
Describe the cremaster muscle and its formation.
What arteries are found in the spermatic cord?
What veins of the cord, and where do they terminate?
What reasons for varicocele so often on the left side?
Describe the whole course of the vas deferens.

OF THE ANTERIOR FEMORAL REGION.

What is meant by Scarpa's triangle?
What are the boundaries of this triangle?
How far down the thigh does this triangle extend?
What important structures are contained within it?
What structures cover the femoral artery?
What branches arise from the femoral artery?
Where does the profunda femoris arise?
How far below Poupart's ligament does it arise?
What is its direction and distribution?
What relation does the femoral vein bear to the artery?
What is the position of the anterior crural nerve?
What else passes beneath the crural arch?
What branches of the nerve accompany the artery?
How far down the thigh do they accompany it?
What covers the artery along the middle of the thigh?
What becomes of it below that point?
What muscle is pierced by it to become popliteal?
What and where is Hunter's canal?
Where is the femoral artery usually ligated?
What structures will require division to reach it?
What position does the internal saphenous vein occupy?
Where does this vein terminate?
Through what opening does it reach the femoral vein?

OF THE POPLITEAL REGION.

What is the extent of the popliteal space?
What constitutes its internal boundary?
Describe the parts which form this boundary.
Describe the external boundary of the space?
What passes through the middle of the space?
Describe the whole course of the popliteal nerve.
In what part of the space is the peroneal nerve found?
What is next deeper than the popliteal nerve?
What is immediately underneath the vein?
What separates the artery from the bone?
What between the nerve and the vein?
Where would the artery be reached for ligation?
What branches does the artery give off?
Where are these branches distributed?
Into what does the popliteal artery divide?
Describe the course of its branches.
What nerve accompanies the posterior tibial artery?

OF THE LEG.

What groups of muscles on the leg?
What muscles overlie the posterior tibial artery and the nerve?
How high may the posterior tibial be ligated?
On which side of the leg, and under what muscle?
Describe the position of the anterior tibial artery.
What parts enclose the artery above the middle?
Between what muscles may the artery be found?
What nerve accompanies the anterior tibial artery?
Describe the origin and course of that nerve.
Describe the position of the internal saphenous vein.
Where is the external saphenous vein situated?
What nerve accompanies it, and how is it formed?

OF THE MALLEOLAR AND PLANTAR REGIONS.

How many tendons between the malleoli in front?
Name them in order, from the inner to the outer side.
What artery in that region, and where is it situated?
How many tendons behind the inner malleolus?
Name them in order, and the destination of each?

What artery in this region, and where situated?
What is found to accompany the posterior tibial artery?
What tendons behind the outer malleolus?
What prominent tendon posteriorly?
What muscles unite to form this tendon?
Are any vessels endangered in dividing the tendo Achilles?
What vein is nearest to the tendon, and where found?
What artery is nearest, and where situated?
What structures cover the sole of the foot?
Describe the plantar fascia and its attachments.
What muscles next beneath that fascia?
What arteries on the sole, and where situated?
Describe the division of the posterior tibial artery.
Describe the nerves accompanying these branches.
What structure on the sole is divided in surgery?
Are these vessels and nerves near the fascia?

ANATOMY OF THE RESPIRATORY APPARATUS.

What is the frame-work of the larynx, and its position?
Which is the largest cartilage, and what is its position?
Describe its shape and connections.
Where is the cricoid situated, and what is its shape?
What is the shape and position of the arytenoid cartilage?
Where and for what purpose is the epiglottis placed?
Where and what is the glottis.
How many and where are the vocal cords?
What space is between the superior and inferior vocal cords?
What and where is the rima glottidis?
What is the shape of the opening, and how large is it?
What structure is next below the larynx?
What is the structure and length of the trachea?
Describe the rings and their investing membrane.
What structures between the rings in front?
What structures complete the trachea posteriorly?
Where does the division of the trachea occur?
Which bronchial tube is the larger, and which the longer?
How do the two differ in their general arrangement?

How do the bronchial tubes differ from trachea?
What is the importance of cartilage in these structures?
What other elementary tissues besides cartilage?
Where is the yellow fibrous tissue found?
What is the purpose of the muscular structure?
What use does the elastic tissue serve?
How do the bronchial tubes finally terminate?
Describe all the structures concerned in their formation.
What is the nature of the lining membrane of the bronchia?
What kind of epithelium characterizes this membrane?
Does the epithelium line the air cells?
How large are the air cells in human lungs?
How many around each terminal bronchus?
How many in the entire lungs?
What is the estimated surface of the lung for aeration?
What is the estimated surface of the body?
What is the estimated proportion of the two?
How thick is the tissue between blood and air?
Where are the pulmonary capillaries distributed?
Why are the lungs divided into lobes?
Describe the structures that enclose the lungs.
What forms the lower boundary of the thoracic cavity?
What forms the lateral and superior boundary?
By what means are the lungs filled with air?
By what means are they emptied of air?
Which requires the greater muscular effort?
What reason will you assign for the difference?
What is the action of the diaphragm in this work?
What other muscles coöperate in respiration?

OF THE ABDOMEN AND ITS CONTENTS.

Into what regions is the abdominal cavity divided?
Name each one and describe its boundaries.
What is contained in the right hypochondriac region?
What parts occupy the epigastric region?
How is the left hypochondriac region filled?
Name the contents of each of the regions below.
Describe the positions of the viscera filling each?
What membrane lines the abdominal cavity?

To what class of membranes does it belong?
What amount of surface does this membrane present?
What amount of fluid is normal to it?
What fold or reflection of it covers the viscera?
Describe the reflections making the omentum.
How are the intestines retained in position?
What do the layers of the mesentery embrace?
Describe the mesenteric glands and the vessels.
How are the ligaments of the liver formed?
Describe the ligaments of the liver.
How is the spleen held in place?
What is meant by the alimentary canal?
How is the intestinal canal divided?
What are the subdivisions of the small intestines?
What is the length of each division?
How is the large intestine divided?
Give the length and position of each portion.
What is the aggregate length of the intestines?
Describe the position and relations of each part.
Name the orifices of the stomach and their positions.
Describe the curvatures and vessels of the stomach.
What are the different coats of the stomach?
How is the pyloric orifice closed?
Over what portion is the mucous membrane thickest?
Describe the glandular apparatus connected with it.
Where are the peptic glands and peptic cells found?
What becomes of the blood from the stomach?
What nerves are distributed to the stomach?
What coats exist in the intestines?
What is next internal to the serous covering?
What layers of muscular fibres do they have?
What is their arrangement in the large intestines?
What causes their sacculated appearance?
In what manner does the ileum unite with the cæcum?
What valve is found at the place of union?
Describe its arrangement and office.
What is the vermiform appendix, and where situated?
Describe its size, shape and function.

How is the colon held in position?
What part of it in the left iliac region?
What is meant by valvulæ conniventes?
In what part of the intestines do they first appear?
How far down the canal do they extend?
Describe their structure and general appearance.
What smaller structures on the valvulæ conniventes?
Describe the villi and to what extent they are found.
Are they present in the stomach and colon?
What vessels commence in these villi?
How are these lacteal vessels arranged?
What is their ultimate termination?
What relation have they to the mesenteric glands?
What glands are found in the duodenum?
What collections of glands in the ileum?
How and where are the glands of Peyer arranged?
In what portion of the ileum are they most numerous?
Describe the follicles of Lieberkuhn.
In what portion of the canal are they found?
What glands are found in the large intestines?
Does absorption occur in all intestines alike?
In how many ways does it occur in the stomach?
Into what does absorption occur in the small intestines?
Is there lacteal absorption in the large intestines?
In what way does this absorbed material enter the circulation?

APPENDAGES OF ALIMENTARY CANAL.

How many and what salivary glands?
Describe the parotid and its excretory duct.
What is the location of the submaxillary gland?
What is its duct, and where does it terminate?
Describe the position and ducts of the sublingual gland.
When is the functional activity of these glands?
What glands are found in the mucous membrane of the mouth?
What position do the tonsils occupy, and what is their use?
What glands are contained within the pharynx?
What region of the abdomen does the liver occupy?
By what means is it supported in position?

By what organs is the liver surrounded?
What vessels carry blood to the liver?
What vessels carry material from the liver?
Describe the origin and distribution of the hepatic artery.
What vessels unite to form the portal vein?
Where does this vein enter the liver?
What vessels accompany it in its course?
What vessels carry blood from the liver?
Where do the hepatic veins terminate?
Describe the form and divisions of the liver.
What inequalities on its under surface?
What position does the Spigelian lobe occupy?
Name and describe the fissures of the liver.
What is the ultimate structure of the liver?
How are the lobules arranged?
What veins penetrate the lobules?
What vein in the centre of the lobules?
What veins receive the intra-lobular veins?
Where is the hepatic secretion formed?
By what vessels does the bile leave the liver?
Describe the shape and location of the gall-bladder.
Name the different bile ducts and their office.
Where is the bile discharged, and at what time?
What position does the pancreas occupy?
Describe its size and shape.
Where does its duct terminate?
What vessels supply the pancreas?

OF THE GENITO-URINARY APPARATUS.

What position do the kidneys occupy?
What difference on the two sides?
What structures enclose the kidney?
What is the immediate investment of the kidney?
What artery supplies the kidney with blood?
Where does the renal vein terminate?
In what respect do the two veins differ?
What varieties of structure in the kidney?
What is the character of the cortical portion?
Describe the structure of a Malpighian body?

How is the tubular portion of the kidney arranged?
What are Malpighian pyramids, and how arranged?
What and where is the calyx of the kidney?
What is meant by the pelvis of the kidney?
What is the position and shape of the pelvis of the kidney?
What channel conveys the secretions away?
What is the structure of the ureter and its length?
Name particularly the tissues forming it.
Describe its course from the kidney to the bladder.
How and in what part of the bladder does it terminate?
Describe its passage through the walls of the bladder.
What position does the urinary bladder occupy?
What is meant by the fundus and base of the bladder?
Describe the coats and structure of the bladder.
What portion is covered by peritoneum?
How are the fibres of the muscular layer arranged?
What peculiarities in the lining membrane?
How is the urethral canal divided?
What are the relations of the prostatic portion?
What is the extent and position of the membranous portion?
What envelops the third portion of the urethra?
What is the structure of the urethra?
What are its relations to the rest of the penis?
Describe the structure and attachments of the penis?
What is the structure of the scrotum?
What covering next beneath the integument?
What tissues form this dartoid structure?
What structures next beneath the dartoid structure?
What membranes invest the testicle?
What is the nature of the tunica vaginalis?
With what was it originally connected?
By what process did it become separated?
Where is the water of hydrocele, or dropsy of the testicle?
Where is water in dropsy of the scrotum?
What and where is the tunica albuginea?
What is the corpus Highmorianum or mediastinum testis?
What membrane inside the tunica albuginea?
What is the character of the gland structure?

How are the tubuli-seminiferi arranged?
What structure separates the lobuli testis?
What and where is the epididymis?
What and where are the globus major and globus minor?
What is the excretory duct of the testis?
Where does this duct terminate?
Describe its course from testis to termination.
What and where are the vesiculæ seminales?
Describe their structure and connections.
What and where is the ejaculatory duct?
Where does this duct terminate?
What sinus near their place of opening?
What is the structure and size of the prostate gland?
How large and where are its excretory ducts?
Where are the glands of Cowper situated?
In what part of the urethra do they terminate?
What secretion is furnished by the prostate gland?
What is the object of the vesiculæ seminales?
What are the properties of the spermatic secretion?

OF THE UTERUS AND ITS APPENDAGES.

What is the size and structure of the uterus?
Describe its position and means of support.
What ligaments pass laterally from it?
How and where do these ligaments terminate?
Describe the course and termination of the round ligaments.
Describe the structure of the Fallopian tube.
In what does it terminate externally?
What are its attachments and relations?
Where are the ovaria situated, and how connected?
What is the structure of the ovary and its size?
Describe the size and shape of the uterine cavity.
How are the uterus and vagina connected?
What kind of membrane lines the uterus?
What variety of epithelium lines the Fallopian tube?
Where do mucous and serous membranes unite?
What membrane covers the uterus?
What is its extent on the anterior surface of the body?
What relation does it bear to the posterior surface?

MATTERS PERTAINING TO HISTOLOGY.

The study of Histology is so naturally preceded by some elementary matters, that I have decided to introduce the examination of tissues by a brief consideration of the materials out of which tissues are made.

As preliminary even to that, it will be useful to enquire briefly into the characteristic differences between the inorganic and the organic kingdoms, which I have stated in a concise form, as follows:

I POINT OF DIFFERENCE.

1. The inorganic was arranged by *chemical* force—a mineral.
2. The organic was arranged by *vital** force—a leaf.

II POINT OF DIFFERENCE.

1. The inorganic increases by *accretion*—a crystal.
2. The organic increases by *intussusception*—a fly.

III POINT OF DIFFERENCE,

1. The inorganic *never had life*—a stone.
2. The organic is what it is, *by virtue of life*—a tree.

IV POINT OF DIFFERENCE.

1. The inorganic is *never nourished*—a rock.
2. The organic *grows by nourishment*—a fish.

V POINT OF DIFFERENCE.

2. The inorganic has *no offspring*—a pebble.
2. The organic *reproduces its kind*—a bird.

* By which is meant that power or capacity of a living animal or vegetable to do with matter what a dead one cannot do, understanding the words "living" and "dead" in the ordinary sense. A living tree produces leaves; a dead one cannot do it.

ANIMALS AND VEGETABLES CONTRASTED

For the sake of further comparison, I have ventured to express, very concisely, the differences between the vegetable and animal kingdoms, which appear more clearly in the following mode of statement:

I POINT OF DIFFERENCE.

1. The vegetable appropriates *inorganic* matter in growing.
2. The animal requires *organic* matter for its growth.

II POINT OF DIFFERENCE.

1. The vegetable absorbs matter *as it finds it.*
2. The animal *prepares* it for absorption.

III POINT OF DIFFERENCE.

1. The vegetable *assimilates* and *grows.*
2. The animal *assimilates*, *grows*, and *repairs waste.*

IV POINT OF DIFFERENCE.

1. The vegetable *lives* and *grows.*
2. The The animal *lives*, *grows*, and *perceives.*

V POINT OF DIFFERENCE.

1. The vegetable is only *acted upon.*
2. The animal *performs voluntary acts.*

VI POINT OF DIFFERENCE.

1. The vegetable *consumes* carbonic acid.
2. The animal *furnishes* carbonic acid.

VII POINT OF DIFFERENCE.

1. The vegetable *liberates* oxygen.
2. The animal *consumes* oxygen.

THE COMPOSITION OF MAN.

In the first place, I interrogate the chemist as to what he finds in man, and receive for answer that he is composed of the following 15 ultimate elements, viz:

Oxygen, Hydrogen, Carbon, Nitrogen, Sulphur, Phosphorus, Calcium, Magnesium, Sodium, Potassium, Chlorine, Fluorine Silicum, Iron, Manganese.

Such then is man from the standpoint of the chemist.

OF PROXIMATE PRINCIPLES.*

I find that two or more of these ultimate elements unite to make Proximate Principles, which mark a step in advance toward tissues. These Proximate Principles I have ventured to classify as follows:

FIRST.

Those inorganic in their nature; crystallizable; existing alike in the inorganic and the organic kingdoms. Their chemical composition is definite. *E. g.:* Water, Chloride of Sodium, Carbonate and Phosphate of Lime, etc., etc.

SECOND.

A group of organic origin; non-nitrogenous; of definite chemical composition; composed of three elements, C. H. O.; mostly crystallizable; number small. *E. g.:* Sugar, Oil, and perhaps Starch.

THIRD.

Organic substances proper; albuminoid group; nitrogenized group; non-crystallizable; chemical constitution, variable; class, numerous. *E. g.:* Albumen, Fibrin, Casein, Globuline, Musculine, Osteine, etc., etc.

FOURTH.

Excrementitious Proximate Principles of organic origin; formed by dis-assimilation; mostly crystallizable. *E. g.:* Carbonic Acid, Cholesterine, Creatine, Creatinine, etc., etc.

* A Proximate Principle may be defined to be a substance existing in the body and removable from it as such, which cannot be further sub-divided without chemical decomposition and loss of its characteristic properties.

FLUIDS OF THE BODY.

To facilitate their study, I group the fluids of the body as follows:

I. CIRCULATING FLUIDS.

1. Chyle.
2. Lymph.
3. Blood.

II. FLUIDS FOR DIGESTION.

1. Saliva.
2. Gastric secretion.
3. Pancreatic fluid.
4. Bile.
5. Intestinal juice.

III. FLUIDS OF CLOSED CAVITIES.

1. Arachnoid.
2. Pleural.
3. Pericardial.
4. Peritoneal.
5. Joints, Bursæ, etc.
6. Fluids of the Eye and Ear.
7. Cellular tissue.

IV. SECRETIONS FOR PROTECTION.

1. Cerumen.
2. Lachrymal.
3. Mucous surfaces.
4. Oily, on surface of the body.

V. SECRETIONS FOR DISCHARGE.

1. Intestinal secretion.
2. Renal secretion.
3. Cutaneous secretion.
4. Pulmonary vapor.

VI. FLUIDS FOR REPRODUCTION.

1. Spermatic.
2. Menstrual.
3. Fluids of Embryo.

VII. SECRETION FOR NOURISHMENT.

1. Milk.

TISSUES OF THE BODY.

A limited number of Proximate Principles are usually combined to make a tissue; another step in advance toward organs. I have found the following classification useful:

I. OSSEOUS. Including

1. Bones and
2. Teeth.

II. CARTILAGINOUS. Including

1. Pure cartilage and
2. Fibro-cartilage.

III. FIBROUS. Including

1. White and
2. Yellow.

IV. MUSCULAR. Including

1. Striated and
2. Non-striated.

V. NERVOUS. Including

1. Cerebro-spinal and
2. Sympathetic.

VI. ADIPOSE. Including

1. Fat cells and
2. Enclosed fat.

VII. EPITHELIAL. Including

1. Epithelium,
2. Epidermis,
3. Hair and
4. Nails.

I trust the arrangement of fluids and tissues which I have introduced will be found profitable to the student, and greatly promote an acquaintance with Histology.

GENERAL QUESTIONS.

The following are only a few on the topics considered, designed to indicate the line of investigation, instead of the amount of knowledge desirable on each subject:

A COMPARISON OF INORGANIC AND ORGANIC SUBSTANCES.

Give a definition of *Inorganic* substances.
What are *Organic* substances?
What is the first point of difference between them?
What is the second difference named?
Describe the third point of difference.
Give a definition of *life* or *vital force*.
What is the fourth difference previously named?
On what force does nourishment depend?
Give an account of the fifth difference.
Which has usually the least variety of elements?
What causes the difference in durability?
Why is change so prompt after loss of vitality?
What forces assume control after life ceases?
How then do they differ in chemical composition?
How do they differ in their internal structure?
How do they vary in general conformation?
How do they differ in their mode of origin?
How do they differ in their manner of destruction?
What are the two most striking differences?
What is an organized body?
Wherein does an organic substance differ from an organized?
How are organized bodies first divided?

A COMPARISON BETWEEN VEGETABLES AND ANIMALS.

What is the first difference between vegetables and animals?
What is the second great difference between them?
What is involved in the preparation for absorption?

What is the third difference above indicated?
Is excretion a vegetable function?
Name and describe the fourth difference.
Is there any perception in the vegetable?
What is the fifth difference to be considered?
What relation has carbonic acid to these two kingdoms?
What difference in regard to oxygen?
How is the purity of the air maintained?

OF THE COMPOSITION OF MAN AS VIEWED BY THE CHEMIST.

How many *ultimate elements* are found in the human body?
In what condition do they usually exist?
Name the four present in largest quantity?
Of these, which is most abundant?
How generally are they found in the body?
What substance is devoid of nitrogen?
In what conditions does oxygen exist in the body?
Where and in what condition does carbon exist?
Where and in what state is hydrogen found?
Where is nitrogen found, and in what condition?
In what structures does sulphur exist?
In what state is phosphorus found?
In what organs is it most abundant?
What proportion of the brain is phosphorus? (1-170,—Von Bibra.)
Where and in what form does calcium exist?
Where is magnesium found, and how combined?
In what combination is sodium found?
In what condition is potassium?
Is sodium or potassium more abundant?
In what tissues does silicon exist?
Where and in what form is iron found?
What proportion of the blood is iron? 1-2000.
Where has manganese been observed?
Can the body be nourished without food containing minerals?
Is the proportion in the body constant or variable?

OF PROXIMATE PRINCIPLES.

What is a *Proximate Principle?*
Are authors agreed in grouping them?

What groups are already given?
Name the principal substances in the first group.
Which is most abundant in the first group?
What is the composition of *water?*
Where do we find water, and in what conditions?
Why is an abundant supply of this so requisite?
Name the principal uses of water in the body.
What proportion of the body is water?
Are any tissues of the body devoid of water?
In what condition is the water in the solids?
What quantity of water is consumed daily?
Where is it principally discharged?
Where do we find *chloride of sodium?*
What purposes does it serve in the body?
What influence has it on endosmosis and exosmosis?
Does it aid in the solution of other substances?
In what solids is this substance most abundant?
In what fluid of the body do we find the most?
Can the system do without this ingredient?
What is the effect on animals deprived of it?
In what form is it eliminated from the system?
Is it decomposed in the system?
Where is *chloride of potassium* found?
In what way does it appear to be useful?
By what means is it discharged from the system?
In what condition does *lime* exist in the body?
Where and in what combination is it found?
For what purpose is it principally employed?
What is the composition of phosphate of lime?
Where is it found in greatest abundance?
What proportion of bone does it form?
In what condition does it exist in bone?
How can it be removed from bone?
What is its condition in the circulating fluid?
What other salt unites with this in bone?
By what means is it eliminated from the system?
Where is *carbonate of lime* found?
What purposes does it serve the system?

Where do we find *carbonate of soda?*
Where does it appear to be most useful?
How is it introduced into the system!
Is it formed in the body by chemical changes?
Where is *carbonate of potassa* found?
Is it produced within the body?
In what way does it seem to be useful?
Where do we find *phosphate of magnesia?*
Where are *phosphate of soda* and *potassa* found?
In what respect do these prox. princ. resemble each other?
Are they generally decomposed within the body?

OF THE SECOND GROUP OF PROXIMATE PRINCIPLES.

What is the second group of proximate principles?
Of what ultimate elements are they composed?
Is their chemical constitution definite?
In what respects do they resemble each other?
What is the composition of starch?
Where is it found in the human body?
Is it a normal constituent of the system?
Is it introduced into the circulation as *starch?*
What are its principal sources as food?
What is the chemical constitution of *sugar?*
What are its varieties in the human system?
Do milk sugar and liver sugar agree in composition?
Is sugar produced in the system?
Where is it found in a pathological state?
What are its supposed uses in the system?
What are its principal sources of supply for man?
What is the chemical constitution of *oil?*
Is oil a simple or a compound substance?
Name the principal constituents of oil.
In what respect do oleine, margarine and stearine differ?
At what temperature do they respectively congeal?
What is glycerine, and where is it found?
In what condition is oil found in the system?
In what condition does it exist in milk?
What purposes does it serve in the body?
What food is most likely to promote its increase?

OF THE THIRD GROUP OF PROXIMATE PRINCIPLES.

Describe the third class of proximate principles.
By what general terms is it known?
Why are they called *protein compounds?*
What chemical elements are found in this group?
Why does not this group crystallize?
In what different conditions does this group exist?
Name the principal articles of the group.
Where and in what condition is *fibrine* found?
What proportion of the blood is fibrine?
Where is *albumen* found, and in what condition?
At what temperature does albumen coagulate?
What proportion of the blood is albumen?
What is the chemical constitution of *caseine?*
Where and in what condition is it found?
What are its principal uses in the body?
Where is *globuline* found, and in what state?
In what substance is it soluble?
Where is *ptyaline* found in the system?
Where is *pepsine* produced, and by what means?
What purpose does it serve in the system?
What proximate principle in the *pancreatic* fluid?
What is the chemical constitution of *osteine?*
In what proportion does it exist in bone?
What change occurs from long boiling?
What is the organic ingredient of *cartilage?*
What is *chondrine*, and how is it formed?
Where is *musculine* found, and how procured?
Where is *keratine* obtained, and in what manner?

OF THE FOURTH GROUP OF PROXIMATE PRINCIPLES.

What are the principal products found in this group?
Where and in what way are they produced?
What is the ultimate destination of this group?
Where is *carbonic acid* formed, and where discharged?
Where is *cholesterine* formed, and where eliminated?
What is the composition of cholesterine?
Where is *urea* found, and what is its constitution.
By what means is it eliminated from the body?

What is the origin of *creatine* and *creatinine?*
What other matters are formed by disassimilation?
Name the four outlets for this excrementitious matter.
Can its elimination be safely delayed?

OF THE ORGANIZATION OF TISSUES.

What elementary structure precedes the formation of tissues?
What primitive parts make up a typical cell?
What is the typical form of a cell?
What is the constitution of an animal cell-wall?
In what ways do animal cells originate or increase?
Describe the endogenous mode of increase.
Give an account of the fissiparous mode of growth.
Is there such an act as free cell development?
In what conditions do cells exist in the human body?
What forms do cells assume in their changes?
Name some of the transient cells of the body.
What are some of the permanent cells in the body?
Do cells in the body possess vitality?

OF DEVELOPMENT.

Give a definition of development.
What is the meaning of hypertrophy?
What is the meaning of atrophy?
State some conditions that interfere with development.
What is the effect of the normal use of the growing part?
What will be the result of neglect to use the growing part?
What will result from deficient supply of blood?
What will be the result of defective innervation?
What influence has temperature on development?
What is the effect of a deficient amount of sun-light?
Name some of the causes of hypertrophy.
Give an example of physiological hypertrophy.
What are examples of pathological hypertrophy?
Name the principal causes of atrophy.
Define physiological and pathological atrophy.
What are homologous formations?
What are heterologous growths?
Which have the greater vitality?
Which are the more rapid in development

OF THE FLUIDS OF THE HUMAN BODY.

I. OF THE CHYLE.

What is the first group as arranged?
What is the source of this material?
Where is the chyle obtained for examination?
What are its physical properties when first obtained?
What gives it the milky color usually seen?
What is meant by its molecular base?
What changes in its passage through the glands?
What is its ultimate destination?
What is the estimated quantity in twenty-four hours?
By what forces is the chyle circulated?
Trace its course from the lacteals to the heart.
Over what extent of surface is chyle absorbed?

II. OF THE LYMPH.

What kind of fluid do the lymphatics circulate?
Where do they ultimately discharge their contents?
What is the source of the fluid they contain?
For what purpose does the fluid leave the blood vessels?
By what force is this fluid circulated?
What amount of fluid in the twenty-four hours?
With what other fluid is this mingled in its course?
Trace carefully its origin, course and discharge.

III. OF THE BLOOD.

What is the third circulating fluid as grouped?
Is its color the same in all animals?
In what element of the blood does the color reside?
What is the proportion of discs in human blood?
Describe their size and shape in human blood.
Where, and of what size, are the smallest discs found?
In what animals are the discs oval?
In what animals are the blood discs nucleated?
How do the discs of the embryo differ from the adult?
What proximate principles are found in discs?
What makes up most of the blood discs?
In which one of these principles does the color reside?

What metal is found in blood discs?
In what chemical condition does it exist?
Is it the same in arterial and venous blood?
What is the function of the iron in the blood?
On what does the difference of color depend?
In what way do blood discs originate?
Where are they *supposed* to be formed?
Are they permanent or transient structures?
What seems to be their principal use?
Do they normally escape from blood vessels?
Have the discs a distinct cell-wall?
Are they soluble in water or blood serum?
What is meant by nummular arrangement?
Under what circumstances is it observed?
How many discs disappear with each pulsation?
What is the estimated average life of the discs?
What other blood disc, and of what size?
What is the proportion of red and white blood discs?
Is the relative size preserved in different animals?
Are they distinct anatomical forms?
Is there evidence that white are changed to red?
Is the definite use of white discs settled?
Describe the structure of white blood discs.
Where else in the system are similar bodies found?
What is meant by sarcodic expansion?
In what discs has it been observed?
What proportion of blood is fibrin?
In what condition is fibrin in circulating blood?
What change occurs when withdrawn from the body?
Describe the process of coagulation or fibrillation.
What causes coagulation to take place?
Under what circumstances will blood not coagulate?
What is the chemical constitution of fibrin?
Is the origin of fibrin settled among physiologists?
What are the different opinions entertained?
State the views of Simon and others who agree with him.
What proportion of the blood is albumen?
Describe its condition and chemical constitution.

At what temperature does it coagulate?
What are its uses in the blood and system?
What is the color of blood in renal veins?
What is its color flowing from a gland in activity?
What is its color from an ordinary passive gland?
What is the explanation of this difference?
What causes the difference in color of arterial and venous blood?
What is removed from the blood in the lungs?
What is the color of venous blood in syncope?
What constituents of blood not yet named?
In what condition do they exist in blood?
How often does the blood pass through the heart?
State concisely the uses of the blood?
What part of man's weight is blood?

II. OF FLUIDS FOR DIGESTION.

What fluids in the second group as given?
What is the first fluid mingled with our food?
Name the different glands that furnish saliva.
Describe the fluid from the parotid gland.
What are its physical and chemical properties?
Under what circumstances is it secreted?
What is meant by unilateral secretion?
What amount of this secretion in twenty-four hours?
What is the second source of saliva?
What difference between parotid and submaxillary secretion?
When is this secretion poured into the mouth?
What is the third gland furnishing saliva?
What are the peculiarities of this fluid?
What other secretion mingles with these?
What organic principle is found in saliva?
What valuable chemical property has saliva?
Does it ever become acid in disease?
How do preparations of mercury injure the teeth?
Are medicines ever eliminated by these glands?
What amount of saliva in twenty-four hours?
How does its excessive secretion affect the system?
What effect has saliva on the sense of taste?

How is it useful in deglutition?
On which element of our food does it seem most to act?
What effect does it produce on starch of the food?
Should saliva be discharged from the system?

OF THE GASTRIC SECRETION.

What is the source of the gastric juice?
Describe carefully the apparatus that furnishes it.
What are its physical properties?
What are its chemical properties?
What organic principle does it contain?
What other constituents are found in gastric juice?
When is the gastric juice secreted?
Does it accumulate in the stomach without food?
What acids are found in the gastric secretion?
What amount of gastric juice is furnished per day?
What effect has this secretion on decomposing food?
What agency has this secretion in digestion?
What portion of the food is acted upon by the gastric juice?
What name does the food bear as it leaves the stomach?
Is the water of the gastric juice absorbed from the stomach?

OF THE PANCREATIC SECRETION.

What is the source of the third fluid of this group?
What amount of this fluid per day?
What are its physical and chemical properties?
Where is it discharged into the intestines?
What agency has it in the digestive function?
On what element of the food does it operate?
Is its secretion constant or intermittent?

OF THE HEPATIC SECRETION.

What is the specific gravity of bile?
Describe its physical and chemical properties.
When is the bile secreted most freely?
What apparatus furnishes the bile?
What is the estimated quantity per day?
What substances are found in the bile?
What is the nature of cholesterine?

What is its supposed origin in the system?
What appears to be its ultimate destination?
What general purposes does this bile serve?
What is the effect of preventing its entering the intestines?
What influence has the bile upon absorption?
What elements does it most aid in absorption?
What becomes of the bile itself in the intestines?
What effect has the bile on peristaltic action?
What effect has it on the putrefaction of the chyme?
Why do the bowels become constipated in its absence?
Why is diarrhœa apt to supervene?
Is bile a product of the liver, or simply an educt?

INTESTINAL JUICE.

What additional fluid is poured into the intestines?
What is the source of such intestinal secretion?
What purpose does the intestinal secretion serve?
How may its production be determined?

III. FLUIDS OF CLOSED CAVITIES.

What fluids are comprised in the third group as named?
What kind of membrane lines these cavities?
In what respects are they similar?
Describe the properties of the arachnoid fluid.
What amount is contained within the pericardium?
What purpose does this fluid serve there?
Describe the quantity and quality of the pleural fluid.
What is the nature of the peritoneal fluid?
What is the extent of the peritoneal membrane?
What amount of fluid does the peritoneal cavity contain?
What kind of fluid is found in the joints?
What fluids pertain to the eye and ear?
What is the nature of the fluid in areolar tissue?

IV. SECRETIONS FOR PROTECTION.

Name the fluids in the fourth group.
Where is the *cerumen* found, and by what furnished?
Describe its properties and uses in the body.
What gland furnishes the *lachrymal secretion?*
Where is this secretion discharged, and for what use?

Trace its course from the gland to the nose.
What are its physical and chemical properties?
What purpose does it serve for the eye?
What kind of secretion do the *mucous* membranes furnish?
By what apparatus is the mucus secreted?
What is the particular agency in its formation?
What structural element does mucus contain?
Where are the sebaceous glands, and how arranged?
What kind of material do they furnish?
What are its specific uses to the system?

V. SECRETIONS FOR DISCHARGE.

How many and what secretions in the fifth group?
What is the source of the *intestinal secretion?*
What is the use of Peyers and the solitary glands?
What do the the follicles of appendix vermiformis furnish?
Are the isolated glands of the colon for elimination?
What apparatus furnishes the renal secretion?
Describe the structure of the Malpighian corpuscle?
What is the particular function of the Malpighian tuft?
What do the cells on the tubuli uriniferi furnish?
What are the physical and chemical properties of urine?
What are the principal constituents of the urine?
What amount of fluid is furnished during the day?
When is it secreted most abundantly?
What other abundant outlet for fluids from the body?
What relation do these bear to each other?
Describe the entire course of the urine till its discharge.
What waste material does the urine contain?
What amount of urea in the twenty-four hours?
Is it formed in the kidney or preformed in the blood?
What is the chemical constitution of urea?
What is its supposed source in the system?
What is the chemical composition of creatine?
What other material similar in composition?
In what form are these ingredients discharged?
What is the result of arrested renal secretion?
What apparatus furnishes the cutaneous secretion?
In what form is this usually discharged?

What amount of perspiration in twenty-four hours?
What are the chemical properties of this secretion?
What are its uses to the system?
What is the source of the pulmonary vapor?
What are its sensible properties?
What material does it hold in solution?
What is the estimated quantity per day?
What purpose does this secretion serve?
Why does the odor of breath vary so much?

VI. FLUIDS FOR REPRODUCTION.

Name the fluids of the sixth group.
What is the source of the first one named?
What kind of structure furnishes this secretion?
What structure lines the tubuli seminiferi?
Describe the development of the spermatozoa?
What other secretion mingles with that from the testes?
What is the fertilizing element of the spermatic fluid?
What structure for its reception at the base of the bladder?
What seems the office of the vesiculæ seminales?
What fluid from prostate gland, and its use?
What is the nature and source of the menstrual fluid?
Under what circumstances does this discharge occur?
What is the usual quantity at each period?
What is the physical significance of this discharge?
Where and in what structure is the germ-cell furnished?
With what fluid is this germ-cell surrounded?
What fluids are connected with the embryo in development?
What is their essential object?

VII. FLUID FOR NOURISHMENT OF THE OFFSPRING

What apparatus furnishes this nourishment?
What are the normal constituents of human milk?
What microscopic elements does it contain?
What is the great proportion of milk?
In what condition is the sugar of milk?

QUESTIONS IN HISTOLOGY.

What grouping of tissues is adopted in this work?
What is the first group, and how is it divided?
Is there any grouping generally recognized by authors?

OF THE COMPOSITION OF BONE

What is a bone?
What is the composition of bone?
Describe the animal matter of bone?
What is its intimate structure?
How may we obtain it for examination?
What proportion of ordinary bone is earthy matter?
What circumstances cause the composition to vary?
What is the composition of the earthy matter?
How are the animal and earthy matter united?
What is the ultimate form of the earthy matter?
How can its granular character be shown?
How do we obtain the earthy matter free from the animal?

OF THE STRUCTURE OF BONE.

How is bone nourished?
What are Haversian canals?
Have these canals a lining membrane?
What is the general plan of arrangement in long bones?
How are they arranged in flat and short bones?
How large are they, and what is their shape?
Does the blood circulate freely through them?
How do Haversian canals differ from small vessels elsewhere?
What other cavities exist in compact bones?
What is the shape of the osseous lacunæ?

How large are these cavities?
By what other names are they known?
Are they the same in the bones of all vertebrates?
What communication between lacunæ?
How large are these canaliculi?
What is their shape and purpose?
What is their general plan of arrangement?
What is the object of the lacunæ and canaliculi?
Have they a lining membrane?
What is an Haversian rod or ossicle?
Describe its structure and plan of growth.
How many laminæ surround the Haversian canal to make a rod?
How many varieties of textures in bones?
Where do we find the compact tissue?
Where do we meet with the cancellated?
What arrangement of cancelli for strength?
What advantage results from the cancellated?
Do Haversian canals exist in cancellated bone?
How thick may the plates be without canals?
How thick without lacunæ and canaliculi?
What fills the cancellated structure?

OF THE DEVELOPMENT OF BONE.

What is Osteogeny?
What immediately precedes bone?
What precedes the cartilage?
What different modes of development of bone?
How early does ossification commence?
What is the first change observed in the cartilage?
Describe the progress from this ossifying point.
Describe the way in which bones elongate.
In what way is their diameter increased?
How are Haversian canals formed in their increase?
What is meant by diaphysis of bone?
What is an epiphysis?
What is the purpose of an epiphysis?
How are epiphyses useful in the young?
How late do the epiphyses remain separate?

Where is the intra-membranous mode of growth seen?
Describe the process in the cranial bones?
How are the sutures of the cranial bones formed?
How do the flat bones enlarge?
What is the purpose of sutures in the cranium?
At what age is ossification completed?
Do bones change like soft parts through life?
What is the evidence of such change?
When is bone most vascular?
Is elasticity a useful property of bone?
When are bones most liable to fracture?
What is the cause of this liability?
What varieties of osseous tissue are seen?
What is the difference between compact and cancellated?
Is the ultimate structure materially different in the two?
Is the compact of uniform density?
How are bones immediately covered?
What portions of bones are covered with cartilage?
Describe the character and uses of the periosteum.
Has it sensibility and vascularity?
Do vessels from it penetrate the bone directly?
Is healthy bone sensitive?
Can nerves be demonstrated in bone?
Are lymphatics known to exist in bone?
What kind of membrane lines the large cavities of bone?
Describe its character and uses.
What fills the hollow bones?
What fills the cancellated structure?
What is the use of these substances?
What bones receive air into their cavities?
When are these cavities formed?
What is the usual plan in birds?
Are the bones solid in any animals?
What example of very light skeleton?
Give an example of a very heavy one.
What change in bone in advanced age?
Does their weight change with age?
Is the animal matter strong in old age?

Is bone absorbed in old age in disease?
What part is most likely to be absorbed?
Will bones bend without breaking?
Will a callus bend or yield to pressure?
Is exostosis true bone in structure?
When arteries are said to be ossified, is it bone?
Is true bone formed in the soft parts in disease?
What are distinguishing characters of true bone?

TEETH.

What are teeth?
How many sets of teeth?
How many in each set?
What classes of teeth in each set?
How many in each class?
What is the form of each class?
How many and what roots to each tooth?
How is each tooth divided?
What is meant by the crown of a tooth?
What is its neck, and where is it?
What is attached to the neck of a tooth?
What structure envelops the root of the tooth?
What structures in each tooth?
Describe the structure and composition of enamel.
What are its properties and position?
Where is the dentine situated?
By what other name is it known?
What is the structure of dentine?
Describe its position and properties.
Where is the cementum or crusta petrosa?
Describe its structure and thickness.
What is the purpose of this element in the teeth?
What is the structure of exostosis on the teeth?
What occupies the cavity of the tooth?
What is the nature of that structure?
Is the tooth painful after the pulp is dead?
How are the teeth retained in place?
What is the nature of the attachment?
Describe the structure of the investing membrane.

DEVELOPMENT OF THE TEETH.

How early is the first provision for the teeth manifested?
Where and what is the first appearance observed?
When is the papillary stage completed?
What is the next stage, and when is it completed?
When is the saccular stage manifested?
Describe the character and progress of each stage.
What work succeeds the saccular stage?
What part of the tooth is formed first?
What element of the crown is first formed?
How is the eruption of the tooth accomplished?
What part of the tooth is formed last?
When and where is the enamel formed?
When do the first of the first set appear?
When is the first set completed?
By what process are they removed?
When does this naturally occur?
What is the first provision for the second set?
Describe their position and process of development.
How many teeth and rudiments at six years of age?
When do the second set begin to appear?
When are they completed?
Why are we furnished with two sets of teeth?
Is there ever a third set of teeth?
Do teeth change like bones?
Have they the power to repair injury like bone?
Are teeth necessarily worthless when the pulp is dead?
If teeth are removed and replaced, will they live?
What change occurs in the jaw when teeth are removed?
If the gum be cut from a tooth will it re-unite?
If it be detached by tartar or ulceration will it unite?
To what part of a tooth does the gum adhere?
Will it ever adhere to the enamel?
Is there ever direct union of tooth and jaw?
What is the nature and source of the tartar on teeth?
Is it harmless or injurious to the teeth?
In what way does it produce its injurious results?
How does it cause the destruction of undecayed teeth?

CARTILAGINOUS TISSUE.

What tissues are included in the cartilaginous group?
What are the varieties of pure cartilage?
What is temporary cartilage, and for what purpose?
What is the essential structure of temporary cartilage?
Is it properly a vascular tissue?
Do temporary and permanent cartilages differ in structure?
Where are some of the permanent cartilages used?
What purpose does the costal cartilage serve?
Where is articular cartilage found?
On what part of the bone is it thickest?
Has articular cartilage any synovial covering?
Is articular cartilage vascular?
How is it nourished in this situation?
What peculiar arrangement of vessels in the bone beneath?
Do nerves exist in articular cartilage?
What properties give it its greatest value?
Where is the membraniform variety of cartilage found?
For what general purpose is this variety employed?
In what respect does it differ from the articular cartilage?
Does the intercellular substance show a fibrous character?
What membrane envelops this cartilage?
Does it differ essentially from periosteum?
Where do we find *fibro-cartilage?*
Describe its structure and composition.
For what purpose is it usually employed?
What material is between the bodies of the vertebræ?
What portion of that substance is firmest?
What fills the similar place in fish?
Where do we find interosseal fibro-cartilage?
Name the principal joints containing it.
Describe the one at the lower jaw articulation.
What is the plan of arrangement at the knee joint?
What joints contain circumferential fibro-cartilage?
What is the purpose of this arrangement?
How is fibro-cartilage for vascularity and sensibility?
Does cartilaginous tissue ulcerate?
Does it undergo fatty degeneration?

OF FIBROUS TISSUE.

How many varieties of fibrous tissue?
Are they found separate or mingled?
What is meant by elasticity?
Is it a property equally of dead and living matter?
By what tissue is this principally manifested?
Describe its structure and composition.
For what purpose is this tissue employed?
Where is it found most abundantly in man?
Name the different organs where it is used.
Are its properties manifested by any stimuli?
What is its comparative vitality?
Does it readily undergo ulceration and disintegration?
Has it much vascularity and sensibility?
Describe the white fibrous tissue.
What are its composition and physical properties?
For what purpose is it usually employed?
Name the principal places where it is found.
What property gives this tissue its main value?
What is the structure of ligaments?
What is the structure of tendons and of fascia?
What are the principal fasciæ of the body?
Describe some of their varieties.
Are the thick and thin ones essentially different?
What is meant by aponeurosis?
What is its structure and usual purpose?
What kind of structure invests the osseous system?
How are tendons, ligaments and periosteum united?
Describe fully the extent, structure and use of this tissue.
Does white fibrous tissue readily ulcerate?
Describe its comparative vascularity and sensibility.

CELLULAR TISSUE OR CONNECTIVE TISSUE.

Give a definition of cellular or areolar tissue,
What relation does it bear to organs?
What is meant by subcutaneous cellular tissue?
Where is this tissue most adherent to the skin?

Where is this structure most dense?
Where is it more loose and movable?
Where does the fluid accumulate in œdema?
In what part of the tissue does it most readily collect?
Where is the air in emphysema of the lung?
What are the uses of this subcutaneous cellular tissue?
What is the character of submucous cellular tissue?
If very loose, where would it be dangerous?
Is the sub-mucous cellular tissue uniform in density?
Is the sub-serous cellular tissue loose or dense?
What purpose does this laxity serve?
Name a case of dense adherent serous texture.
What does this adherent serous and fibrous membrane form?
Name the examples of them in the body.
Describe the minute structure of cellular tissue.
What change takes place on long boiling?
Does this tissue possess contractility?
Of what tissue is areolar a variety?
What is the great purpose of cellular tissue?

OF THE MUSCULAR SYSTEM.

What is meant by contractility?
What tissue manifests this property?
How many varieties of muscular tissue?
By what different names is each variety known?
Which form is most abundant in the human body?
What has the lowest form of development?
What are the various names given to it?
What is the minute structure of this involuntary fibre?
How long and wide are the fibres? 1-500. 1-5000.
What kind of organs does it usually form?
Where is it found mingled with other tissues?
What is its usual color and vascularity?
Does it possess much sensibility?
Does it contract slowly or rapidly?
Name the organs principally formed by it.
What is peculiar in the development of the uterus?
How is it so rapidly reduced after parturition?

What is the other form of muscular fibre?
Which has the highest form of development?
By what different names is it known?
Give the reason for each name.
What is the usual color of this variety?
Is the color the same in lower animals?
What is meant by fasciculus?
What is the peri-mysium, and what is its structure?
What is understood by a muscular fibre?
What is the length of a muscular fibre?
How large is the ordinary human fibre?
Give the name and structure of its exterior.
What is contained within the myolemma?
What is meant by sarcous element or sarcode?
Describe the structure and arrangement of fibrillæ?
How large are the fibrillæ?
How many fibrillæ constitute a fibre?
What causes the transversely striated appearance?
Do nerves and blood-vessels penetrate the myolemma?
How are these vessels and nerves arranged in the muscle?
What is the origin of the sarcolemma?
When muscles enlarge by use, do the fibres increase in number?
In atrophy, does the number diminish?
Do all the fibres of a muscle contract at once?
What causes the zigzag appearance of the fibre at times?
Does the entire length of fibre contract at the same time?
How are fibres attached to bone and to tendon?
Is the structure of myolemma and tendon similar?
Is the contraction of voluntary fibre slow or rapid?
How is contraction of the muscle excited?
Is the temperature affected by activity?
What causes this change of temperature?
Is the contraction of a single fibre long continued?
What is meant by tonicity of muscle, or tonic contraction?
What is meant by active contraction?
What is its condition in rigor mortis?
What does rigor mortis indicate?
How long after death will this condition remain?

What change occurs in muscular fibre not used?
What change occurs in fatty degeneration?
Where does the fat accumulate in the degeneration?
What form of muscular fibre in the heart?
Is it voluntary or involuntary in structure?
Which form does it most nearly resemble?
Is irritability an inherent property of muscular fibre?
How can this be shown by experiment?
Does muscular irritability cease at death?
How long will it continue, and what arrests it?
In what class of animals will it remain longest?
Is this irritability readily exhausted by excitation?
How are fibres arranged with reference to tendons?
When is a muscle said to be fusiform?
What is meant by penniform and semi-penniform muscle?
What principles are adopted in naming muscles?
What is meant by digastric muscle?
What is meant by biceps and triceps?
Name and describe a radiated muscle.
What is meant by origin and insertion of muscles?
What rule is followed in giving the origin and insertion?
Mention some muscles named from their situation.
Mention those named from their direction.
What ones are named from their shape?
Mention some named from their attachment.
Which part is placed first in compounding the name?
Mention such as are named from the number of heads.
What are some named from their action?

NERVOUS SYSTEM.

OF THE CEREBRO-SPINAL SYSTEM.

How many varieties of neurine or nerve tissue?
Give the different names of the vesicular neurine.
By what other name is the fibrous neurine known?
Give the reason for each of these several names.
Where is the vesicular neurine found?
Describe its characteristics of shape and color.
Name some of the varieties of these cells.

Describe the unipolar, bipolar and multipolar forms.
How large are these nerve cells?
What is the essential structure of vesicular neurine?
What is a ganglion, and how is it formed?
Have ganglia any particular size?
Where are the ganglia of the cerebro-spinal system?
What is the structure of *fibrous neurine?*
How large are these nerve fibres?
Describe the neurilemma and its use.
What is next within the neurilemma?
Describe the white substance of Schwann.
What occupies the centre of the fibre?
By what different names is it known?
What is the use of each part of the fibre?
What other structure is like the neurilemma?
Do nerve fibres branch in their course?
In what different ways do nerves terminate?
Where do we find the looped arrangement?
Where have they a free extremity?
Where do we find Pacinian bodies?
What is the structure of these bodies?
How is the nerve fibre arranged in them?
What is the fourth mode in which fibres terminate?
How and where do nerve fibres originate?
Are all nerve fibres connected with cells?
What is understood by afferent fibres?
By what other names are they known?
By what other names is the efferent fibre known?
Is there any structural difference in these fibres?
What is a plexus, and for what purpose is it formed?
What is meant by peri-neurium?
Is the peri-neurium of uniform thickness?
What is meant by a compound nerve?
What is meant by a simple nerve?
Where in the brain do we find fibrous neurine?
Where is the fibrous neurine in the spinal cord?
Which root of spinal nerve has a ganglion upon it?
How does fibrous neurine vary in the arm and in the brain?

OF THE SYMPATHETIC NERVOUS SYSTEM.

By what names is this system known?
Why is it called the ganglionic nervous system?
Why is it called the nervous system of organic life?
Why is it called the sympathetic nervous system?
What is the most distinguishing feature of the system?
What is the meaning of the word ganglion?
Describe the structure of a ganglion.
Name some of the smallest and largest in the body.
What ganglia are found about the head?
Describe the lenticular ganglion and its position.
Where is the ganglion of Meckel situated?
Name the position of each cranial ganglion.
How many cervical ganglia, and where placed?
What communication with the cervical ganglia?
What branches of distribution from these ganglia?
How many thoracic ganglia, and where placed?
Describe the branches of communication with each.
Describe the branches of distribution from each.
What becomes of the branches from the first five ganglia?
Describe the nerve formed by the next five?
What become of the branches from the eleventh and twelfth?
Describe the abdominal ganglia.
What is their number and their position?
How many and where are the pelvic ganglia?
What ganglia are connected with the heart?
Where are the *semilunar* ganglia situated?
Describe the *solar plexus* and the branches from it.
What ganglion does the great splanchnic nerve join?
What becomes of the lesser splanchnic nerve?
How are the plexuses arranged for distribution?
Name the principal ones in the abdomen.
How do the nerve branches reach their destination?
Are cerebro-spinal and sympathetic fibres alike in structure?
Describe the characters of the gelatinous fibre?
To what system do the ganglia on the posterior roots of the spinal nerves belong?

ADIPOSE TISSUE.

What is included in the adipose tissue?
Are the fat cells universally distributed?
Do they exist within the cavity of the cranium?
Describe the fat cells and their plan of arrangement.
Are they distinct from the areolar tissue?
How large are the fat cells? 1-200, 1-1000 av. 1-600.
What is the composition of the fat in the cells?
At what temperature does human fat congeal? (63.)
On what does the different density of fat depend?
At what temperature does oleine congeal? (At zero.)
At what temperature does margarine solidify? (118 F.)
Does fat ever exist independent of the fat cell?
What is understood by stearosis?
Where is the fat in fatty degeneration of muscle?
What other tissues are liable to fatty degeneration?
What purpose does fat serve in the body?

OF THE EPITHELIAL GROUP OF TISSUES.

I. OF EPITHELIUM.

What structure belongs to the epithelial tissues?
Where is the epithelium found?
Describe the general properties and character of epithelium.
What are the principal varieties of epithelium?
Where is the scaly epithelium found?
What portion of the alimentary canal does it cover?
What variety of epithelium is next in the canal?
In how many layers does this variety occur?
What is its essential structure?
What modification of it occurs in the stomach?
Where do the peptic glands occur?
How far in the alimentary canal does the conoidal extend?
What kind of epithelium lines the air passages?
What is the essential feature of ciliated epithelium?
How far down the air passage does it extend?
What constitutes the lining of the air cells?
What variety of epithelium occurs in the urinary bladder?
What lining has the urinary apparatus generally?

What form of epithelium lines the Fallopian tubes?
What kind of epithelium lines the tubuli seminiferi?
What modification of it occurs after puberty?
What constitutes the inner lining of blood-vessels?
What variety of epithelium where absorption and secretion occur?
What variety where its office is protective?

II. OF EPIDERMIS.

What structure covers the surface of the body?
Has epidermis sensibility and vascularity?
What structure is immediately beneath it?
Describe its formation and changes from first to last.
What and where is the rete mucosum?
What is the general purpose of the epidermis?
What influence has it on evaporation?
On what part of the body is it most developed?
In what respects does it resemble epithelium?
What proximate principle is found in cuticle?

III. OF NAILS.

To what class of structure do the nails belong?
In what manner are the nails produced?
What structure is concerned in their development?
If the nail is violently removed is it reproduced?
If the matrix be destroyed is it then reproduced?
What proximate principle is obtained from nails?
What resemblance between nails, claws and hoofs?
Is the deer's horn (so called) horn or bone?

IV. OF HAIR.

What other epithelial structure of the body?
Name the different parts of a hair.
In what way is it produced?
What is the nature of a hair follicle?
What exists at the bottom of the follicle?
What is the nature and structure of this papilla?
What causes the roughness on the surface of a hair?
If a hair be violently removed is it reproduced?
How can superfluous hair be permanently removed?

OF THE PARTS CONCERNED IN CIRCULATING THE FLUIDS OF THE BODY.

What organs are concerned in circulating the blood?
What structures form the heart?
What variety of muscular fibre in the heart?
How are these fibres arranged on the ventricles?
Describe the fibres as arranged in different layers.
What is the structure of the auricles?
What is the lining membrane of the heart?
What tissues form the valves?
Describe the septum ventriculorum.
Describe the septum auriculorum.
What communication between the auricles in fœtal life?
What traces of it in the adult heart?
What opening between right auricle and ventricle?
What is the ordinary size of that opening?
How large is the orifice to the pulmonary artery?
What opening between left auricle and ventricle?
What is the size of this opening?
What valves close these several openings?
What is the ordinary weight of the heart?
How large are the cavities of the heart?
What nerves are supplied to the heart?
Where are the cardiac ganglia situated?

STRUCTURE OF BLOOD-VESSELS.

How many and what coats form the arteries?
What is the structure of the outer coat?
What is the structure of the middle coat?
What is the comparative thickness of these two coats?
What elementary tissues form the middle one?
What forms the inner coat, and how thick is it?
What membrane forms the inner lining?
Which of the coats is usually thickest?
In what part of the arteries is muscular tissue found?
What is its particular use in arteries?
Where is the elastic tissue most abundant?
Is the proportion of these elements the same in all arteries?

What is the especial use of the elastic tissue in arteries?
How are the fibres mostly arranged in the middle coats?
How are the walls of arteries nourished?
What caution is necessary in tying arteries?
Do the vasa vasorum penetrate the middle coat?
Do they penetrate the inner coat of the arterial wall?
Do arteries possess sensibility?
What is the source of their nervous supply?
What occasions the pulse?
Where does the elasticity of the arteries reside?
On what particular tissue does it depend?
Do arteries contract after death?
Are they elastic after death?
Why are arteries usually empty after death?
What is meant by tonicity of arteries?
Is the muscular action slow or rapid?
When does the muscular power show itself?
When is the elastic property called into action?
To what pathological changes are arteries subject?
What coat is most liable to calcareous degeneration?
At what age is it most liable to occur?
Are these alterations of structure likely to be remedied?

OF THE VEINS.

How many coats have the veins?
What is their structure as compared with arteries?
How do they compare in thickness?
Wherein do they differ from arteries?
What is the arrangement of the inner coat?
Describe the valves of veins more fully.
What is the comparative capacity of veins and arteries?
Have they the same elasticity as arteries?
Are arteries or veins most abundant?
What is meant by anastomosis?
What is the object of anastomosis in blood-vessels?
Do vessels contract on the application of stimuli?
Do they contract by mechanical stimuli?
Do they contract by chemical stimuli?
Do they respond to electrical stimuli?

OF THE CAPILLARIES.

Where are the capillary vessels found?
What is the structure of capillaries?
Have they distinct coats like other vessels?
What is the general size of capillaries?
What is the ordinary length of these vessels?
As the artery approaches the capillary, which coat first disappears?
How is the middle coat then arranged?
Where does that coat finally cease?
What is the character of the capillary wall?
Have capillaries any definite plan of arrangement?
How are they arranged in muscular fasciculi?
Do these vessels penetrate the muscular fibre?
Is the change from capillary to artery or vein abrupt?
Are the capillary vessels elastic?
Does their size vary with the force of circulation?

OF THE PORTAL CIRCULATION.

Where is the portal vein situated?
What veins form it, and where do they unite?
What is the source of the blood flowing through it?
Name the peculiarities of structure of these veins.
Where does the portal vein terminate?
What is the ultimate destination of the portal blood?
Wherein is the portal circulation peculiar?
By what force is the portal blood moved?
What influence will the contracting intestine have upon it?

OF THE LYMPHATICS.

Where are lymphatic vessels found?
What is their size and relative thickness?
What causes their peculiar beaded appearance?
Where are the lymphatics most abundant on the limbs?
Describe fully their origin and general arrangement.
Where do they ultimately discharge their fluid?
What other system of vessels resembling lymphatics?
Where and in what way do lacteals originate?
What is their ultimate termination?

What structures are connected with these vessels?
Describe the structure and purpose of mesenteric glands.
What is the structure and use of lymphatic glands?
Describe the structure and position of the thoracic duct.
Where does it discharge its contents?
Describe the difference of the lymphatics and lacteals.
Describe also their similarities.
What purpose do these sets of vessels serve?
Where do the lymphatics get the fluids they circulate?
Where and how do the lacteals become filled?
By what forces do their contents circulate?
What has endosmotic force to do with it?
What tissues of the body have lymphatics?
What system of nerves supply blood-vessels?
How are the nerves arranged that supply the vessels?
Do blood-vessels contract through their influence?
What nerves are sometimes called vaso-motor?

OF THE FORCES THAT CIRCULATE THE BLOOD.

What agency has the heart in this important work?
With what force does the heart act in propelling the blood?
By what stimulus is the contraction induced?
Describe the course of the blood through the heart.
Describe particularly the action of the auricles.
What prevents the backward flow of the venous blood?
What action succeeds this, and in what order?
Describe the action of the ventricle and the valves.
When the ventricle is contracting, what occurs in the auricle?
By what agency is the tricuspid valve closed?
Does this valve completely close the orifice?
What is the office of the columnæ carneæ?
In what way are the cordæ tendineæ useful?
What other valve similar in structure and function?
By what agency are the semilunar valves closed?
What causes the sounds of the heart?
How many, and what sounds are recognized?
In what way is the first or prolonged sound made?
What different explanations of it have been given?

When and where is the second or short sound made?
What causes the impulse of the heart against the chest?
By what means is the ventricular diastole accomplished?
Is this an active or a passive dilatation?
By what force are the auricles filled?
What agency has the pericardium in the circulation?
Is there any suction power in the heart?
State concisely the course of the blood through the heart.
State clearly the action of each portion of the heart.

OF CIRCULATION IN THE ARTERIES.

What property of the aorta aids in the circulation?
In what tissue does this property reside?
How does this promote the movement of the blood?
To what extent will it accomplish this?
What other useful property besides elasticity?
On what does the contractility depend?
In what sized arteries is it most manifest?
What is the condition of the arteries after death?
Do arteries contract slowly or rapidly?
What causes the redness of the blush, and the pallor of fear?
By what system of nerves are vessels affected?
If this nerve be divided in the neck, how is the circulation of the head affected?
How will the temperature be changed by it?
What explanation may be given of this phenomenon?
When arteries divide, what is the comparative size of the trunk, and the total of its branches?
What is the meaning of "rete mirabile?"
Where is it found, and what purpose does it serve?
What purpose is served by very tortuous arteries?
State concisely the agency of arteries in the circulation.

OF CIRCULATION IN VEINS.

Name the forces that move the venous blood.
How does the action of the muscular system influence it?
How does the dilatation of arteries influence it?
How does the force of inspiration move venous blood?

Is there any suction power of the heart to influence it?
What constitutes the "vis a tergo" to move venous blood?
What is the "vis a frontè" to aid the flow of venous blood?
Does muscular contraction of veins aid the flow?
Will endosmotic force influence the flow of venous blood?

OF THE CAPILLARY CIRCULATION.

By what force is the blood moved through capillaries?
Will the heart force the blood through capillaries if not changed?
What is understood by capillary force?
Is there any propelling power in the capillary?
How do capillary vessels vary in size?
In what way is the capillary force generated?
Is it due to physical or vital causes?
What is the average length of capillaries?
What is the ordinary size of these vessels?
What is their aggregate capacity compared with arteries?
How rapidly does blood move in arteries?
What is the rate of circulation in the veins?
How rapid is its progress in the capillaries?
Is the blood ever arrested in its course in health?
What power or force secures the flow of sap in vegetables?
What promotes its flow in the embryo before a heart is formed?
What power causes the periodic and local variations?
What causes blood to move in the portal veins?
What moves it in capillaries, after the heart is removed?
What causes the empty condition of arteries after death?
How is the blood moved in an acardiac fœtus?
How do cold and carbonic acid retard the flow of blood?
How are the phenomena of asphyxia explained?
What causes the circulation in the placenta?
What secures the flow of fluid in animals without a heart?
State concisely the agency of capillaries in the circulation.
What forces are concerned in its performance?
How does capillary force operate to secure the result?

ORGANS PERTAINING TO THE MANIFESTATION OF THE SENSES.

By what senses do we hold relation with the world?

I. OF THE SENSE OF TOUCH.

Where do we find the sense of touch principally developed?
What is the particular structure ministering to it?
Describe the minute structure of the papillæ.
What system of nerves supplies the organs of touch?
How are nerve filaments arranged in these papillæ?
How are the blood-vessels arranged in them?
How are the papillæ arranged on the body generally?
How are they arranged where the sense is most perfect?
Describe them on the ends of the fingers.
How many rows of papillæ under the ridges?
What ducts open on the ridges covering the papillæ?
How does the perspiratory secretion affect the sense of touch?
What structure covers the papillæ?
Where is the epidermis most developed?

II. OF THE SENSE OF TASTE.

In what organ does this sense reside?
Describe the shape and structure of the tongue.
What elevations are met with upon its surface?
What are the different varieties of papillæ?
Over what extent of the surface are they distributed?
On what nerve does the sense of taste depend?
To what part of the surface is it distributed?
What nerve supplies the posterior part of the tongue?
What is the motor nerve of the tongue?
What is the composition of "fur" on the tongue?

III. OF THE SENSE OF SMELL.

What is the apparatus for the sense of smell?
On what nerve does this sense depend?
What is the origin of the first cranial nerve?
Where is the ganglion of this nerve situated?
In what region is this nerve distributed?
To what extent does it supply the nasal surface?

In what manner do these nerve fibres terminate?
What membrane covers the nasal surface?
On what nerve does its common sensation depend?
If the nasal nerve be injured, how is the sense of smell affected?
What is the explanation of this result?
How is this sense in many animals as compared with man?
What is the relative size of the ganglion in these cases?
Is the nasal surface correspondingly complicated?

IV. OF THE SENSE OF HEARING.

How is the organ of hearing divided?
What is the structure of the external ear?
Describe the parts named, and their use.
What is the concha, and with what is it continuous?
What is the form of the meatus auditorius externus?
Give the length and shape of the passage to the tympanum?
What kind of membrane lines this passage?
What secretion lubricates this canal?
What and where is the membrana tympani?
Describe its shape, position and structure.
What is understood by the middle ear?
What kind of membrane lines this cavity?
What communication has it with the pharynx?
Describe the Eustachian tube.
What does the tympanic cavity contain?
Describe the size and shape of the cavity.
Describe each of the bones of the ear.
What are the attachments and articulations of the malleus?
What is the next in order, and its connections?
Describe the shape and articulations of the stapes.
What kind of membrane covers the tympanum?
What parts does the labyrinth include?
Describe the semicircular canals.
Into what portion of the labyrinth do they open?
What is on the other side of the vestibule?
Describe the shape and openings of the cochlea?
How is the cochlea divided, and by what?
What is contained within the labyrinth?

Describe the membranous labyrinth?
What fluid is contained within this membrane?
On what nerve does the sense of hearing depend?
Where does the auditory nerve originate?
Describe its course till it reaches the labyrinth?
In what part of the labyrinth is it distributed?
In what bone is the internal ear contained?
By what means is the sensation of hearing produced?
What is the purpose of the ossicula auditus?
What openings from the labyrinth to the tympanum?
In what manner are these openings closed?
What is the purpose of the liquor of Cotunnius?

V. OF THE SENSE OF VISION.

Describe the cavity for protecting the eye-ball.
What is the form of the eyeball?
How is the external coat of the eyeball formed?
Describe the sclerotic coat and its connections.
What is its structure and comparative vascularity.
Where is it thickest, and where thinnest?
What structure unites with it to complete the eyeball in front?
Describe the different layers of the cornea.
What is next internal to the sclerotic coat?
Of how many layers is the choroid coat composed?
Where does the coloring matter of this coat reside?
How far forward does the choroid coat extend?
What is the purpose of this coat?
With what is it continued anteriorly?
Describe the structure and connections of the ciliary ligament.
What and where are the ciliary processes?
Where and what is the iris?
Describe the structure of this part of the eye.
Of what structural elements is it composed?
Where is the coloring matter of the iris situated?
What is the pupil, and what is its use?
By what means is the pupil varied in size?
To what is the circumference of the iris attached?

What space is between the iris and cornea?
What space immediately posterior to the iris?
What membrane lines these surfaces?
What is its essential nature?
What is the relative size of the anterior and posterior chambers?
What kind of fluid fills these cavities?
What purpose does this fluid serve in the eye?
By what means is the iris caused to contract?
What is next internal to the choroid coat?
Are the choroid and retina united?
What nerve forms the nervous part of the retina?
Describe the optic nerve through its entire course.
Of how many layers is the retina formed?
How far anteriorly does it extend?
In what mode does the nerve terminate?
Describe the minute structure of the retina.
What fills the posterior part of the eyeball?
How is the hyaloid membrane arranged?
What artery penetrates the vitreous humor?
What is between the aqueous and vitreous humor?
How is the crystalline lens held in position?
Describe its shape and minute structure.
Describe the capsule and its surroundings.
What canal around the circumference of the crystalline lens?
What is the seat of cataract?
What is the office of the cornea?
What purpose does the aqueous fluid serve?
What is the office of the iris?
What is the office of the crystalline lens?
To what structural changes is it subject?
How is it removed from the axis of vision?
When the lens is removed, how is vision restored?
Where is the image of the object formed?
What common defect in the eye in old age?
How is this defect of vision restored?
What defect of the eye exists in myopia?
How is this imperfection relieved artificially?

OF THE APPENDAGES OF THE EYE.

Describe the structure of the eyelids.
What membrane lines the lids, and how extensive?
What glands on the inner surface of the lids?
Describe the structure and office of the Meibomian glands.
Name the parts comprising the lachrymal apparatus.
Where is the lachrymal gland situated?
Where does its discharge reach the eyeball?
Where are the lachrymal puncta situated?
What cavity at the inner angle of the eye?
What elevation in that cavity, and what is there on it?
Describe the lachrymal ducts, size, shape, and direction.
Where and of what size is the lachrymal sac?
Where does the nasal duct terminate?
What is the purpose of the lachrymal fluid?
How many and what muscles within the orbit?
How many of these act upon the eyeball?
Describe the origin, insertion and action of each.
Describe those acting upon the eyelids.
What nerves are distributed within the orbit?
What muscles are supplied by the third nerve?
What ones by the fourth and sixth nerves?
What is the office of the ophthalmic nerve?
To what parts is it distributed?

OF THE NERVOUS SYSTEM.

What varieties of neurine in the cerebro-spinal system?
Which of these is the most abundant?
Describe the structure of the fibrous neurine.
What is the ordinary size of the fibres?
What is the purpose of the neurilemma?
What is the object of the white substance of Schwann?
What is the use of the axis cylinder or axis band?
What is the structure of the vesicular neurine?
Name some of the varieties of nerve vesicles.
How are the fibrous and vesicular neurine united?
Which is the most vascular variety of neurine?
Which one occupies the surface of the brain?

How is this arranged in the spinal cord?
What is the plan of the structure of a ganglion?
Describe the simplest form of a nerve system.
What is the meaning of afferent and efferent fibres?
Do sensory and motor nerves differ in appearance?
How are the ganglia arranged in the star-fish?
Are they arranged with symmetry in the mollusca?
How are they arranged in the articulata?
How are ganglia arranged in vertebrata?
Are ganglia independent nerve centres?
What is meant by commissure in the nerve system?
What are the varieties of commissures?
How are longitudinal commissures arranged?
For what purpose are transverse commissures arranged?
What do commissures connect?
Which variety of neurine forms them?
Does the length of the commissure alter its nature?
Describe the principal commissures in the brain.
What is the object of ganglia?
Have ganglia their own separate and distinct office?
What is the largest ganglion of the brain?
Describe the hemispherical ganglion.
What is the office of these hemispherical ganglia?
Is the plan of the convolutions uniform?
How extensive are the convolutions of this ganglion?
In comparing brains of vertebrates, where is the greatest difference?
Are there any brains without convolutions?
Name some of the varieties in this respect.
Is there a relation between convolutions and educability?
Is there any marked difference in the brains of men?
In removing the hemispherical ganglia, what next appears?
Where are the olfactory ganglia situated?
What large ganglia behind them, called corpora striata?
What is the probable office of the anterior cerebral ganglion?
Describe the optic thalami, or posterior cerebral ganglia?
What is their probable office?
What ganglia are posterior to these?
What seems to be the office of the corpora quadrigemina?

What ganglion near the floor of the fourth ventricle?
Where is the respiratory ganglion?
Where and by what name is the lingual ganglion known?
How many classes of ganglia?

OF THE CRANIAL NERVES.

How many cranial nerves are usually recognized?
Describe the origin, exit and distribution of the first.
In what manner does this nerve terminate?
What power does this impart to the nasal surface?
Describe the place of exit and distribution of the second.
What power does this impart to the eye?
What is the origin and exit of the third nerve?
To what muscles of the orbit is it distributed?
What is the function of this third nerve?
Give the origin, exit and distribution of the fourth nerve.
What is the function of this fourth nerve?
Wherein does the fifth nerve differ from the others?
Where does the sensory portion have its origin?
Give the origin of the motor portion.
On what root is the Gasserian ganglion found?
What is the situation of this ganglion?
How is the motor root arranged with regard to the ganglion?
What divisions are given off from the ganglion?
With which division does the motor root join?
Where does the ophthalmic division leave the cranium?
Name its principal branches and their distribution.
What power does it give to the parts supplied?
Name the branches from the second division of the fifth.
To what portion of the face are they distributed?
At what foramen does the third division leave the cranium?
What are its branches soon after its exit?
What becomes of the branch receiving the motor root?
What muscles receive this motor portion of the nerve?
Why is this called the manducatory nerve?
Describe the inferior dental nerve.
Where does the gustatory nerve arise?
Describe its distribution and function.

What different nerves does this Inf. max. nerve furnish?
Describe the functions of each separate portion.
What is the origin and distribution of the sixth nerve?
What is the function of this nerve?
Describe the origin, course and exit of the seventh nerve.
What are its principal branches for distribution?
To what portion of the face is this nerve distributed?
What class of muscles does this nerve supply?
What power does it impart to them?
If this nerve be divided, how is the eye affected?
What is the effect upon the mouth?
Is the seventh nerve ever the seat of neuralgia?
What explanation can be given of this fact?
Give its distribution and functions.
What becomes of the eighth nerve?
What is the origin and exit of the ninth nerve?
To what parts is it distributed?
What power does it confer on the parts supplied?
What is the agency of this nerve in deglutition?
Is it a voluntary or involuntary act?
What part of the act of deglutition is voluntary?
What other nerve aids the process of deglutition?
What is the origin of the tenth nerve?
At what foramen does it leave the cranium?
Name the branches of the tenth nerve high in the neck.
What plexus do they form, and for what distribution?
What is their especial office for the pharynx?
What is the next nerve from the pneumogastric?
Where is the superior laryngeal nerve distributed?
What is its particular office for the larynx?
Describe the inferior laryngeal nerve.
What is its distribution, and what power does it impart?
How will its division affect the voice?
What branches from the pneumogastric in the thorax?
Describe the anterior and posterior pulmonic plexus.
To what part of the lungs are they distributed?
What is the office of this nerve in the lungs?
What is the effect upon the lungs of dividing this nerve?

In what way does its division destroy the animal?
Describe fully its use in man.
Where is the residue of this nerve distributed?
What is its agency in digestion?
How does its division affect the process of digestion?
Name all the branches of the tenth nerve, and their use.
Where does the eleventh nerve originate?
Describe its course till it leaves the cranium.
To what muscles is this nerve distributed?
What is its particular office in the system?
What is the course of the twelfth nerve?
To what function does this nerve minister?
Describe each nerve distributed to any part of the tongue.
Describe the function of each one so distributed?

OF THE SPINAL NERVES.

What is meant by a compound nerve?
Does a nerve fibre transmit nerve influence both ways?
Are motor and sensory nerves united in the nerve centres?
What is understood by reflex nerve action?
How is this reflex action to be explained?
Does it exist in both systems alike?

OF THE GANGLIONIC NERVES.

What is intended by the nervous system of organic life?
What is the distinguishing feature of this system?
Where is the gelatinous nerve fibre found?
Why is the ganglionic called the vaso-motor nerve?
What is the result of dividing this nerve in the neck?
What will result from galvanizing that nerve?
What influence has this nerve on glandular secretions?
Are nerves necessary to nutrition or circulation?
Are nerves necessary to respiration or digestion?
Are nerves always present in animals?
Is there such a thing as a diffused nervous system?
Are nerves necessary to animal heat?
State concisely the object of a nervous system.

ORGANS AND STRUCTURES CONCERNED IN THE PERPETUATION OF THE RACE.

I. OF THE TESTIS AND THE SPERM CELL.

What organ furnishes the sperm cell?
What kind of a gland is the testis?
What is the size of the tubuli seminiferi?
What kind of structure lines these tubes?
What kind of structure is the sperm cell?
By what other name is it known?
Describe its origin and development to maturity.
Describe its course from development to discharge.
What is the semen besides the spermatozoa?
What is the nature and object of the vesiculæ seminales?
What is the nature and office of the prostate gland?
What is the fertilizing portion of the semen?
Describe the spermatozoon and its motions.
How long is this motion observed to continue?
Can it fertilize the ovum after its motion ceases?
Is the formation of the sperm cell the only mode of reproduction?
What is meant by fissiparous reproduction?
What is understood by gemmiparous reproduction?
Which mode does the sperm cell formation resemble?
Is the human sperm cell endowed with vitality?
Is there any such thing as spontaneous generation?
What is meant by the phrase, "*Omne vivum ex ovo?*"
How is apparently spontaneous generation explained?

II. OF THE OVARY AND THE GERM CELL.

What organ furnishes the germ cell?
Describe the shape, size and position of the ovarium.
What is the nature of its internal structure?
What is contained within the ovarian stroma?
Describe the Graafian vessicles and their contents.
How early in life are these discernible?
What is contained within the Graafian vesicle?
What is the size of the human ovum?

Name the different parts of an ovum.
Describe the zona pellucida and its synonyms.
What is next within the vitelline membrane?
What is contained within the vitellus or yolk?
How large is the germinal vesicle?
What is contained within the germinal vesicle?
How large is the germinal spot, and what is its nature?
In what order are these various parts developed?
What and where is the tunica granulosa?
What is the germinal disc, or proligerous disc?
Describe the membrane lining the Graafian follicle.
What does a fully mature Graafian follicle contain?
Under what circumstances is the ovum developed?
How often is an ovum matured and discharged?
At what period of life does this usually first appear?
Describe the process of its discharge from the follicle.
What subsequently marks the place of discharge?
What is the cause and nature of the corpus luteum?
Does a corpus luteum follow every menstrual period?
How does the corpus luteum of pregnancy differ from it?
What becomes of the ovum as it leaves the follicle?
Through what channel does it reach the uterus?
How large is the Fallopian tube?
Describe its position and structure.
Describe the ovarian extremity of this tube.
By what force does the ovum pass through the tube?
At what period of life does the formation of ova cease?
Is the formation of a germ cell dependent upon the sperm cell?

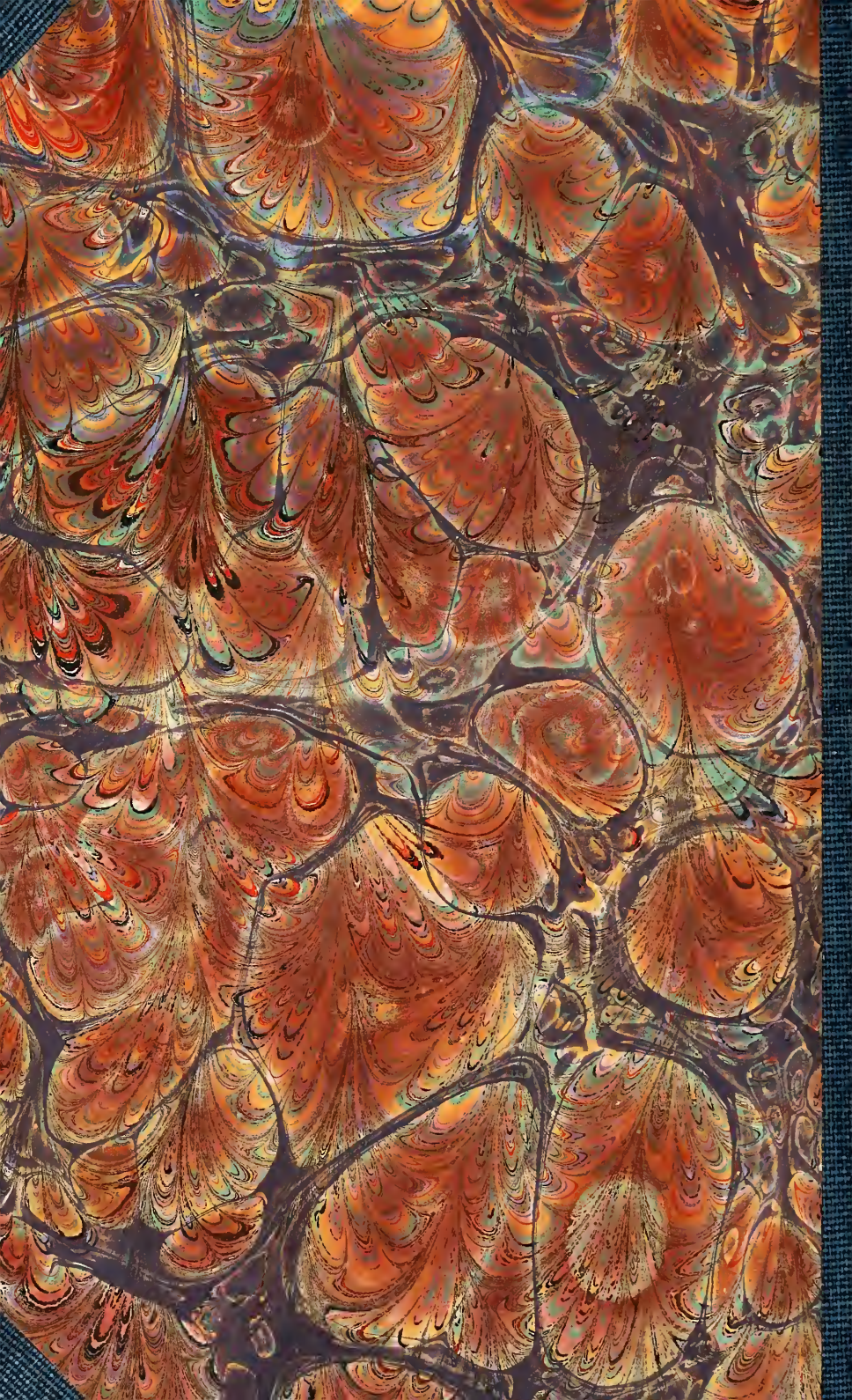
III. OF THE DEVELOPMENT OF THE EMBRYO.

What results from the union of sperm cell and germ cell?
What change in the ovum follows this mingling?
What are the parts of the ovum before fertilization?
What is the first change that can be observed after?
What immediately succeeds the division of cells?
How does it get its material to enlarge?
Describe its condition and changes for the first few days.
What is the provision for its subsequent growth?

What is the structure of the placenta?
What is the provision for its attachment to the uterus?
Describe the uterus where it is attached.
Do the placental and uterine vessels communicate?
Does the blood pass directly from parent to fœtus?
How does it pass from the placenta to the fœtus?
How does it pass from the fœtus to the placenta?
How does it pass from umbilical arteries to the umbilical veins?
How is the blood changed in this passage?
Can injection be passed from parent to fœtus?

IV. OF THE SEPARATION OF FŒTUS FROM PARENT.

By what means is the fœtus detached from the parent?
Where is the placenta attached to the uterus?
What causes the hemorrhage sometimes seen?
By what means is this usually prevented?
Are vessels of the uterus necessarily opened?
What change in the uterus follows parturition?
By what process is its size reduced?
What element or tissue undergoes the change?

V. CHANGES NECESSARY TO INDEPENDENT LIFE.

What is the condition of the lungs previous to birth?
Does blood circulate through the pulmonary vessels?
What is the condition of the heart at birth?
What change occurs in the heart soon after birth?
What change occurs in the *ductus arteriosus?*
Describe its position, use and history.
What change occurs in the *ductus venosus?*
Describe its position, use and history,
What change occurs in the umbilical arteries?
What change occurs in the umbilical vein?
What traces of them remain in the adult?
What is in the intestines at birth?
What is the source and character of the material?
By what means is the new-born infant nourished?